IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 1026
TORMASOV *et al.*	Art Unit: 2151
Appl. No.: 09/918,032	Examiner: Patel, Dhairya A.
Filed: July 30, 2001	Atty. Docket: 2230.0390001/MBR/GSB
For: **Distributed Network Data Storage System and Method**	

Declaration of Alexander Tormasov, Mikhail Khassine, Serguei Beloussov and Stanislav Protassov under 37 C.F.R. § 1.131

Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned, Alexander Tormasov, Mikhail Khassine, Serguei Beloussov and Stanislav Protassov declare and state that,

1. We are the inventors of the above-captioned application, U.S. Appl. No. 09/918,032, filed July 30, 2001.

2. Prior to December 14, 2000, we, the inventors, had completed our invention in a WTO country (specifically, one of the inventors, Serguei Beloussov, was, during the relevant time period, in the United States and in Singapore), as claimed in the subject application, evidenced by the following:

3. Exhibit A, entitled "Redundant Clustered Distributed File System," version 0.3, was previously submitted, and confirms the date of conception prior to the filing date of Boykin et al., U.S. Patent Publication No. 2002/0078461 and Lahr et al., U.S. Patent Publication No. 2002/0046405 (i.e., prior to December 14, 2000).

4. Exhibit D is a document in Russian dated prior to December 14, 2000, discussing the Topological Server ("TopD," the name given to each node of the cluster) and describing system architecture. Exhibit E is the same document with informal translation of some of the portions added to it in [BRACKETS]. (The untranslated portions deal primarily with the details of packet transfer, however, Applicants will provide a translation of the rest of the document if the Examiner deems it necessary.)

5. Exhibit F is a figure illustrating the topology of the system in which the Topological Server ("TopD") "lives," which was also created prior to December 14, 2000.

6. Claim 26 recites the following:

26. A system for organizing distributed file storage comprising:

a plurality of servers providing, to a plurality of clients, file access services for accessing files stored on the plurality of servers; and

a list of neighbor servers maintained by each server, wherein the neighbor servers are a subset of the plurality of servers,

wherein the files are divided into a plurality of pieces stored on the plurality of servers, and

wherein the list is used to obtain information for reconstructing files stored on the distributed file system.

7. The plurality of servers and the list of neighbor servers are discussed, for example, at page 5 of Exhibit A ("each node in a cluster have the same control functions," "each node have information only about some adjacent neighbors it interested in"), and at page 7 of the document ("Logically a node autoconfigure its place with the nearest neighbors to find active participants for redundant data storage. The file system daemons maintain permanently opened connection to node neighbors."). That each server (node) has to maintain a list of the neighboring servers is self-evident from the overall discussion.

8. The list of neighbor servers is also discussed in Exhibit D/E, a document in Russian discussing the Topological Server and describing system architecture. For example, the following portion of the Exhibit E discusses the neighbor list:

> При запуске TopD получает список соседей (neighbour list), некоторые из этих соседей будут статическими, то есть TopD будет стараться поддерживать постоянную связь с ними, остальные динамическими, то есть они будут заменяться с помошью алгоритма динамического конфигурирования. Суть этого алгоритма в том, чтобы динамическими соседями TopD являлись наиболее близкие (по некоторым критериям) ноды TorFS. Каждый сосед в списке имеет свой номер, который используется при маршрутизации пакетов. Соседом номер 0 является сам TopD.
>
> [UPON LAUNCH, THE TOPD RECEIVES A LIST OF NEIGHBORS, SOME OF WHICH MIGHT BE STATIC, IN OTHER WORDS, TOPD WILL ATTEMPT TO MAINTAIN CONSTANT COMMUNICATION WITH THEM, AND OTHERS WILL BE DYNAMIC, IN OTHER WORDS, THEY WILL BE REPLACED USING A MECHANISM OF DYNAMIC CONFIGURATION. THE GIST OF THE ALGORITHM IS IN ENSURING THAT THE DYNAMIC

NEIGHBORS OF TOPD ARE THOSE NODES THAT ARE THE CLOSEST (BY SOME CRITERIA) OF TORFS. EACH NEIGHBOR IN THE LIST HAS ITS OWN NUMBER, USED FOR ROUTING PACKETS. THE NEIGHBOR NUMBER 0 THE TOPD ITSELF.]

9. "File access" is discussed in numerous places in Exhibits A and D/E, for example, section 7, entitled "File Access," on pages 9-11 of Exhibit A.

10. The plurality of clients are discussed, e.g., in section 10 on page 12 of the document, where Virtual Environments (VEs) are addressed:

> **Each VE within a local node should receive its own separate filesystem namespace begin s from root. For the purpose of disk space optimization, we will provide a "copy-on-write" mechanism within a local node.**
>
> **From global node namespace (not within VE) the given filesystem subtree is assigned for VE support. Within it, each VE receives its own subtree for the VE root namespace. Also, some another subtree has been assigned a status of "VE template".**
>
> **For file read access, the VE personal subtree (/.ve/VE-ID/...) has been checked first. If file exists, it is accessed from here. If file here does not exists, VE template subtree has been checked. On success the special kind of link has been created within VE personal subtree. This link copies all file attributes while for the file content application is been redirected to VE template disk space.**

Normally, VEs function similar to a standalone computer and service one or several clients.

11. Also, the plurality of clients are expressly shown in Exhibit F.

12. The aspect "wherein the files are divided into a plurality of pieces stored on the plurality of servers" is discussed, for example, at the top of page 6 of Exhibit A:

> **each file stored in form of pieces and amount of pieces could vary; each piece exist in the only exemplar in system . . . Pieces are stored on distributed nodes, provided high availability**

13. Also, page 9, section 6 of Exhibit A, entitled "Regulated redundancy and versioning," discusses the use of the so called (N,K) algorithms for dividing files into N pieces (in the field of

cryptography, it is understood that typically, though not always, each of the N pieces is stored on a different server), such that any K out of the N pieces can be used to reconstruct the file:

> **Each block stored in form: divided into N pieces, and any K pieces of them (K <= N) are enough to assemble initial block. Size of each block are minimized and equal to (size of block)/K with minimal overhead of some additional info in header. Appropriate mathematics are exists.**
>
> **Typically file divided into at least N = (K+M) pieces, where M - amount of the nodes which could disappear simultaneously. Each block is stored on a separate remote node. There are K+M individual nodes with block pieces and the removal of M of them still gives an ability to restore block.**
>
> **Maximal amount of possible pieces are restricted in the very initial stage of piece creation - and should be reasonable large (up to K*L where L - max nodes in cluster).**

14. This discussion therefore describes one example of an algorithm that can be used to distribute the data of the file across a plurality of servers (nodes). The aspect of distributing a file across multiple nodes (e.g., servers of a cluster) is also discussed at the top of page 12:

> **Pieces distribution algorithm have to place it on appropriate amount of nodes (in agreement with fault tolerance requirements), and provide some migration mechanism to minimize a network loading (just move each piece to node on which it will be used maximally intensively).**

15. The aspect "wherein the list is used to obtain information for reconstructing files stored on the distributed file system" is discussed, for example in the second and third paragraphs of section 6 on page 9, quoted above, where it is clear from the context of the document that the file is reconstructed from the servers on which the N pieces are stored. Also, the portion of the TopD document (Exhibit D/E) quoted above discusses the use of neighbor lists.

16. Therefore, as the above demonstrates, the invention of claim 26 was conceived before the earliest priority date of the cited references.

17. Independent claim 33 is reproduced below:

> 33. A method for distributed file storage comprising:
>
> dividing a plurality of servers into a plurality of groups, with each server belonging to at least one group;

on each server, maintaining a list of neighbor servers belonging to the same group;

supporting file access services on each of the servers;

dividing a file into a plurality of pieces that are derived from the file; and

storing each of the pieces of each file on the servers selected from the list.

18. The aspects of this claim recited in the second, fourth and fifth clauses ("on each server, maintaining a list of neighbor servers belonging to the same group," "supporting file access services on each of the servers," "dividing a file into a plurality of pieces that are derived from the file" and "storing each of the pieces of each file on the servers selected from the list") have been addressed above with reference to claim 26 and Exhibits A, D/E and F, discussed earlier.

19. The aspect of "dividing a plurality of servers into a plurality of groups, with each server belonging to at least one group" is discussed, for example, in the TopD document (Exhibit D/E):

> При запуске TopD получает список соседей (neighbour list), некоторые из этих соседей будут статическими, то есть TopD будет стараться поддерживать постоянную связь с ними, остальные динамическими, то есть они будут заменяться с помошью алгоритма динамического конфигурирования. Суть этого алгоритма в том, чтобы динамическими соседями TopD являлись наиболее близкие (по некоторым критериям) ноды TorFS. Каждый сосед в списке имеет свой номер, который используется при маршрутизации пакетов. Соседом номер 0 является сам TopD.
>
> [UPON LAUNCH, THE TOPD RECEIVES A LIST OF NEIGHBORS, SOME OF WHICH MIGHT BE STATIC, IN OTHER WORDS, TOPD WILL ATTEMPT TO MAINTAIN CONSTANT COMMUNICATION WITH THEM, AND OTHERS WILL BE DYNAMIC, IN OTHER WORDS, THEY WILL BE REPLACED USING A MECHANISM OF DYNAMIC CONFIGURATION. THE GIST OF THE ALGORITHM IS IN ENSURING THAT THE DYNAMIC NEIGHBORS OF TOPD ARE THOSE NODES THAT ARE THE CLOSEST (BY SOME CRITERIA) OF TORFS. EACH NEIGHBOR IN THE LIST HAS ITS OWN NUMBER, USED FOR ROUTING PACKETS. THE NEIGHBOR NUMBER 0 IS THE TOPD ITSELF.]

20. With dynamically configurable list of neighbors, as discussed in the text, it is self-evident that any TopD server can be part of one or more groups (which can change over time).

21. Furthermore, this aspect is discussed in Exhibit A, page 5:

> Locality of all algorithms:
> **each node have information only about some adjacent neighbors it interested in and never have any global tables**

22. Therefore, as the above demonstrates, the invention of claim 33 was conceived before the earliest priority date of the cited references.

23. Claim 45 is reproduced below:

> 45. A method of accessing files in a distributed file storage system comprising:
>
> dividing a plurality of servers into a plurality of groups;
>
> supporting file access services on each of the servers for accessing a file stored on the servers;
>
> at each server, maintaining a list of neighbor servers that belong to the same group;
>
> generating a plurality of pieces from a file to be stored; and
>
> distributing the plurality of pieces to the neighbor servers in the same group in order to achieve a desired fault tolerance level.

24. The aspect of "distributing the plurality of pieces to the neighbor servers in the same group in order to achieve a desired fault tolerance level" is discussed Exhibit A, page 9, section 6, entitled "Regulated redundancy and versioning," which is also quoted above. As noted above, (N,K) algorithms can be used for dividing the file into N pieces, such that any K pieces are sufficient to recover the file. It should be understood that when (N,K) algorithms are used, the N pieces are not the result of a simple "breakup" of the file into smaller pieces—the pieces are derived from the original file contents using an (N,K) algorithm, but they are not mere sub-portions of the file.

25. Thus, a "desired fault tolerance level," in this context, refers to how many of the N servers/nodes can fail (the number "M" in the discussion at page 9, section 6, also quoted below), before the file becomes unrecoverable:

> **Typically file divided into at least N = (K+M) pieces, where M - amount of the nodes which could disappear simultaneously. Each block is stored on a separate remote**

node. There are K+M individual nodes with block pieces and the removal of M of them still gives an ability to restore block.

26. The remaining aspects of claim 45 have been addressed above, with reference to claims 26 and 33.

27. Therefore, as the above demonstrates, the invention of claim 45 was conceived before the earliest priority date of the cited references.

28. Claim 57 is reproduced below:

> 57. A method of naming files in a distributed file storage system comprising:
>
> dividing a plurality of servers into a plurality of groups such that each server belongs to at least one group;
>
> supporting file access services on each of the servers for accessing files of the distributed file storage system;
>
> giving file names for the files uniformly within the distributed file storage system independent of location of the files on the servers;
>
> storing the files in the distributed file storage system using the names; and
>
> accessing the files using the file access services from any of servers.

29. The aspect of file names in the context of the invention of claim 57 is discussed in numerous places in Exhibit A. For example, the following passages on page 3 discuss this aspect (bold is added):

> Considering Linux as a platform for ASP we could mention, that all implementation of local FS do not have the following set of ASP platform requirements:
>
> · **distributed access**
> · **hierarchical uniform naming space**
> · high performance (fast access to any file in cluster)
> · scalability support of 100s computers in network
> · consistency journaling support and transactional features, including fast faults recovery

· **fault tolerance - any computer could be switched off without loosing of access to any data in file system; any network connection could disappear**

30. File names are also disclosed in the context of page 4 of Exhibit A:

> Taking into account current features of Linux FS we could define the following set of data storage server requirements:
>
> - **easy mapping to semantics of local FS** on Linux - ASPdS should operate by the same concepts than local FS (at least, have superset of it implemented)
> - easy integration of it with local FS - localFS have to obtain a new features by calling some ASPdS services, and have to do it effectively
> - distributed access to files (any node in cluster could access it)

31. The following passage on page 5 is also relevant to confirming the conception of this aspect and in particular, to the element "giving file names for the files uniformly within the distributed file storage system independent of location of the files on the servers":

> **In such a implementation we use a local FS as a file cache for global data storage.**

32. The aspect of "storing the files in the distributed file storage system using the names" is discussed, for example, at page 5 of Exhibit A (native Linux file systems obviously use file names):

> **each file stored on a local filesystem, application accesses data via a well balanced and robust implementations of native linux filesystems**

33. Other aspects of this claim have been discussed previously with regard to claims 26, 33 and 45, and in the interest of avoiding redundancy, will not be repeated here.

34. Therefore, as the above demonstrates, the invention of claim 57 was conceived before the earliest priority date of the cited references.

35. Claim 66 is reproduced below:

> 66. A system for organizing distributed file storage comprising:
>
> a plurality of functionally equivalent servers each providing file access services, for a plurality of clients, to files stored on the servers; and

the files being divided into a plurality of pieces stored on the plurality of servers,

wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers.

36. The aspect of "wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers" is discussed in Exhibit A in connection with the (N,K) algorithm, as noted earlier. The servers are functionally equivalent in the sense that any K out of the N servers can be used to reconstruct the file—there is nothing special about any one server compared to any other. This is to be contrasted with such structures as RAIDs, where one of the servers (or drives) of the RAID represents parity or error detection/correction information, and others represent actual data—in this sense, the RAID "servers" are not functionally equivalent, since one of the servers (or drives) stores parity/EDAC data. Note that there is no separate server dedicated to storing catalogs and file descriptions.

37. The remaining aspects recited in this claim have been addressed above, and in the interest of avoiding redundancy, will not be repeated here.

38. Therefore, as the above demonstrates, the invention of claim 66 was conceived before the earliest priority date of the cited references.

39. Claim 69 is a computer program product counterpart of 33, and all of the aspects recited in claim 69 have been addressed above.

40. Thus, Exhibits A, D/E and F confirm that the invention as recited in all the independent claims was conceived prior to December 14, 2000, the earliest filing date of the cited references.

41. Exhibits B and C, also submitted previously, are files from SWsoft repository adapted for WinCVS, used by software developers for storing and using versions of the source code, and also for generating logs of subsequent revisions. The attached files are related to the implementation of at least the invention of the independent claims.

42. CVS - Concurrent Versions System (see, for example http://www.skolelinux.org/portal/contribute/cvs_intro/document_view) is a system that keeps track of changes to files in the software projects. It creates a record of what, why and by whom a file was modified. Exhibits B and C show, for indicated time and dates, changes relating to network connectivity code, including modification system parameters, adaptation of program modules to program shell and associated program modules and bug fixing.

43. As shown in file "topd_spec" (Exhibit D/E) and in the figure of Exhibit F, the software is a topological server that maintains network coherency, monitors network topology and maintains neighbors for hardware nodes. All interactions between nodes are implemented by means of topological servers.

44. Files "config.h,v" (Exhibit B) and "fserv.cc,v" (Exhibit C) collectively represent a partial record of some of the work that was directed to actual reduction to practice of the invention. These two documents (which are two out of numerous files associated with this project) show the development process of an embodiment of the invention. These files reflect only a small portion of the actual work on a project of this magnitude, and typically reflect completion of a task that itself can take days or weeks to complete.

45. Exhibits B and C confirm work on actual reduction to practice in the period between November 30, 2000 through June 19, 2001 ("fserv.cc,v" file) and between February 15, 2001 through October 21, 2002 ("config.h,v" file). It should be noted that an entry in one of these files reflects work on certain project modules as well as works (and entries) in many other files being integral and substantial parts of the whole software code.

46. Exhibit B, a file entitled "config.h,v," is a record of work on the project relating to TopD (Topological module, i.e., the clustered distributed file system discussed in Exhibit A) by Ruslan Iljin ("author media"), an employee (in 2001) of SWsoft, the Assignee of this application and Kirill Korotayev ("author dev"), another employee of the Assignee of this application, between 02/15/2001 and 10/21/2002.

47. The config.h,v file thus represents evidence of work directed to actual reduction to practice of the invention. Of relevance here is the time period 02/15/2001 through 07/30/2001, as reflected in the file. Some of entries from the config.h,v file have been reproduced below. Each entry has a number (e.g. 1.1, 1.2, 1.3, etc.), a date (highlighted for the Examiner's convenience) and a description of the work (in italic), which is copied to the list below from pages 2-6 of the config.h,v file. Commentary explaining the entries and their relevance have been added in **[bold]**:

1.12 **[MODIFYING DEFAULT VALUES OF VARIABLES USED FOR NETWORK DISTANCE MONITORING, REQUIRED FOR NEIGHBOUR SERVERS DEFINITION, MODIFYING NETWORK READ AND WRITE REQUESTS EXECUTION, MOIFYING PROCEDURES FOR SEARCHING AND RETRIEVING SLICES/CHUNKS OF THE FILES STORED ON THE DISTRIBUTED STORAGE), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.06.06**.09.29.18; author media; state Exp;

branches;
[log
*@*** empty log message ****
@
text
@d6 1
a6 1
** $Id: config.h,v 1.11 2001/05/14 13:48:45 media Exp $*
d36 1]

1.11 **[UPDATING VARIABLE FOR NETWORK DISTANCE CALCULATION, A LOT OF BUGS IN ASSOCIATED FILE LISTS FIXED (MODIFICATION OF PROCEDURE OF DETECTING ACTIVE TRANSMISSION CHANNELS), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.05.14**.13.48.45; author media; state Exp;
branches;
[@fixed many bugs in lists
@
text
@d6 1
a6 1
** $Id: config.h,v 1.10 2001/05/02 12:12:18 dev Exp $*
d56 2]

1.9 **[ADDING TOPD CONFIGURATION DATA TO SUPPORT FILE ACCESS SERVICES), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system"), CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system")]**
date **2001.04.13**.09.23.57; author media; state Exp;
branches;
[@remove trailing spaces
@
text
@d2 1
a2 1
** Copyright (C) SWSoft 2000-2001*
d4 3

a6 1
** $Id: config.h,v 1.8 2001/04/12 09:51:01 media Exp $*
a8 2
***
** Author: Ruslan Iljin <media@@www.rt.mipt.ru>]*

1.8 **[MODIFICATION TIMEOUT CONSTANTS TO IMPROVE STABILITY DURING NETWORK STORAGE ACESS, I.E., DURING ACCESS OF THE FILE PIECES STORED ON THE SERVERS (MODIFICATION OF PROCEDURE REQUIRED FOR NETWORK TOPOLOGY MONITORING, IN PARTICULAR, FOR MONITORING NEIGHBOUR SERVERS FOR PLURALITY OF SERVERS, IN INTERMEDIATE VERSION – MODIFYING NEIGHBOUR SERVERS LIST IN DEPENDENCE OF NETWORK CONDITIONS), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system"), SEE ALSO CLAIM 45 ("distributing the plurality of pieces to the neighbor servers in the same group in order to achieve a desired fault tolerance level")]**
date **2001.04.12**.09.51.01; author media; state Exp;
branches;
[log
@header files description
@
text
@d4 1
a4 1
** $Id: config.h,v 1.41 2001/04/12 08:26:34 media Exp $*
d11 1
a11 1]

1.7 **[BUG FIXING, DEFINE DEFAULT TIMEOUTS TO AVOID STARVATION WHILE RETRIEVING FILE DATA AND FILE SYSTEM DATA, CODE REVIEW (MODIFICATION OF PROCEDURE REQUIRED FOR NETWORK TOPOLOGY MONITORING, IN PARTICULAR, FOR MONITORING NEIGHBOUR SERVERS FOR A PLURALITY OF SERVERS, IN INTERMEDIATE VERSION – MODIFYING NEIGHBOUR SERVERS LIST DEPENDING ON NETWORK CONDITIONS), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system")]**
date **2001.04.10**.14.55.41; author media; state Exp;
branches;
[log

@code review
@
text
@d1 11
d39 1
a39 1
/ timeouts */*
d44 2
a45 2
DECLARE int TOPD_TIMEOUT_WRITE_STAGE_1 DEFAULT(20);
DECLARE int TOPD_TIMEOUT_WRITE_STAGE_2 DEFAULT(20);
d47 2
a48 2
DECLARE int TOPD_TIMEOUT_READ_STAGE_1 DEFAULT(60);
DECLARE int TOPD_TIMEOUT_READ_STAGE_2 DEFAULT(60);
d50 2
a51 2
DECLARE int TOPD_TIMEOUT_SNAP_STAGE_1 DEFAULT(15);
DECLARE int TOPD_TIMEOUT_SNAP_STAGE_2 DEFAULT(20);
d53 1
a53 1
DECLARE int TOPD_TIMEOUT_DIRREC_STAGE_1 DEFAULT(15);]

1.6 **[MODIFICATION OF ALGORITHM FOR DEFINING NEIGHBOR SERVERS AND COMPILATION OF DYNAMICALLY CHANGED TABLES OF NEIGHBOR SERVERS, (MODIFICATION PROCEDURES RELATED TO ACTIVE CHANNELS MONITORING), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.03.31**.14.24.19; author media; state Exp;
branches;
[log
@changes in dyn tables
@
text
@d28 17
a44 1
DECLARE int TOPD_TIMEOUT_RECONNECT DEFAULT(30);]

1.5 **[MODIFICATION OF NETWORK DISTANCES MONITORING FUNCTIONS FOR NEIGHBOR SEVERS DEFINITION (LIST OF NEIGHBOR**

SERVERS), MODIFICATION OF FILE SLICES/CHUNKS RETRIEVAL ALGORITHM), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]
date **2001.03.30**.10.31.07; author media; state Exp;
branches;
[@changes for new analize functions
@
text
@d34 3
a36 3
#define _TOPD_READ_ALL_SLICES_ 0 / read all available slices? if 0 read only required number of slices */*
#define _TOPD_REMOVE_AFTER_READ_ 0 / remove snap entry after reading? */*
#define _TOPD_LOOP_PING_ 0 / continue pinging neighbours for dynamic table? */]*

1.4 **[DECLARATION OF NEW VARIABLES AND FUNCTIONS, MODIFICATION OF DEFAULT TIMEOUTS TO IMPROVE STABILITY WHILE RETRIEVING FILE DATA AND FILE SYSTEM DATA), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.03.22**.09.14.13; author media; state Exp;
branches;
*[@*** empty log message ****
@
text
@d1 2
a2 2
#ifndef __CONFIG_H__
#define __CONFIG_H__
d33 4]

1.3 **[MODIFICATION OF PROCEDURE OF POLLING NETWORK SERVERS (NODES) WHILE RETRIEVING FILE DATA AND FILE SYSTEM DATA, DECLARATION OF NEW VARIABLES, SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**

date **2001.03.12**.11.18.26; author media; state Exp;
branches;
next 1.2;

1.2 [better to delete it since ground is week] **[DISCLAIMING TIMEOUT DEFINING VARIABLES, AND ALSO VARIABLES REQUIRED FOR RETREIVING CHUNKS OF THE FILES (IN AN EARLIER VERSION, IMPROVING STABILITY DURING PROCESSING OF DIRECTORY RECORDS), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.02.26**.12.15.11; author media; state Exp;
branches;
next 1.1;

1.1 **[THE INITIAL VERSION OF CONFIGURING PROCEDURE FOR CONFIGURING SERVERS/NODES OF THE NEIGHBOR LIST, SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**

date **2001.02.15**.14.04.50; author media; state Exp;
branches;
[log
*@*** empty log message ****
@
text
@a22 12
DECLARE char TopdAddress DEFAULT("127.0.0.1");*

DECLARE char WorkDir DEFAULT("~/clroot/");*
DECLARE char TmpDir DEFAULT("/tmp/");*

DECLARE int PutFileMaxBloxPerStep DEFAULT(100);
DECLARE int GetFileMaxBloxPerStep DEFAULT(100);

DECLARE int TimeOutPut0Block DEFAULT(5);
DECLARE int TimeOutGetSnap DEFAULT(5);

DECLARE int TimeOutTopdReconnect DEFAULT(5);]

48. Exhibit C, a file entitled "fserv.cc,v" is a record of work on the project relating to the file server ("fserv") by Ruslan Iljin ("author media"). This file is a part of overall project and shows a log of changes, including date and author of changes, a final version of the source code, and the substance of the changes made during development in the "fserv.cc" module, as well as a schedule of project revisions, since some modification of the file header are forced by modification of associated modules.

49. Program module fserv.cc implements a program interface for file-related data request execution, and also for configuration and maintenance of the connections to the neighbor nodes. This code is required for file server interface, and therefore represents a portion of one embodiment of the invention.

50. As shown in the comments embedded to the program code, fserv.cc contains the interface to the file server and also implements the following functions:

Sending packets to client channel,
Send snap, read, dirrec, write request to fserv, where fserv is a node, required for data collection;
Processing snap reply from fserv;
Processing read reply from fserv
Processing dirrecord reply from fserv
Processing block0 reply from fserv.

51. Each such file server "fserv" is the node (server) on which a file piece of the file is stored. The fserv.cc,v file therefore also represents evidence of work directed to actual reduction to practice of the invention.

52. Of relevance here are entries from the time period from 11/30/2000 through 6/19/2001. Some of these entries have been reproduced below, in similar format as above:

1.34 **[MODIFYING PROCEDURE OF DETECTING NEIGHBOR SERVERS (ADDED CODE WHERE HOPS ARE USED FOR DETECTION OF NETWORK DISTANCE), SEE CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**

date **2001.06.19**.13.15.53; author media; state Exp;
branches;
[log
*@*** empty log message ****

@
text
@d6 1
a6 1
** $Id: fserv.cc,v 1.32 2001/06/01 12:22:23 media Exp $*
a161 1]

1.33 **[ADDING TRACING LINES, MODIFYING NETWORK READ AND WRITE REQUEST EXECUTION FOR STORAGE OF FILE PIECES/CHUNKS ON THE SERVERS, SEE, E.G., CLAIM 26 ("a plurality of servers providing, to a plurality of clients, file access services for accessing files stored on the plurality of servers; wherein the files are divided into a plurality of pieces stored on the plurality of servers, and wherein the list is used to obtain information for reconstructing files stored on the distributed file system"), SEE ALSO CLAIM 33 ("supporting file access services on each of the servers; dividing a file into a plurality of pieces that are derived from the file; and storing each of the pieces of each file on the servers selected from the list")]**
date **2001.06.06**.09.29.18; author media; state Exp;
branches;
[log
*@*** empty log message ****
@
text
@d6 1
a6 1
** $Id: fserv.cc,v 1.31 2001/06/01 10:22:34 media Exp $*
d56 1
a56 1
tfsPktType p_type[6]={
d60 1
d70 1
d91 1
a91 3
**parameters : reqid - RequestID of snap request*
** buff - address of data buffer*
** length - length of data buffer*
d110 1
a110 3
**parameters : reqid - RequestID of snap request*
** buff - address of data buffer*
** length - length of data buffer*

d129 1
a129 3
* *parameters : reqid - RequestID of snap request*
* *buff - address of data buffer*
* *length - length of data buffer*
d141 19]

1.32 **[MODIFYING NETWORK READ AND WRITE REQUESTS EXECUTION, MOIFYING PROCEDURES FOR SEARCHING AND RETRIEVING SLICES /CHUNKS OF THE FILES STORED ON THE DISTRIBUTED STORAGE, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.06.01**.12.22.23; author media; state Exp;
branches;
[log
*@*** empty log message ****
@
text
@d6 1
a6 1
* *$Id: fserv.cc,v 1.31 2001/06/01 10:22:34 media Exp $*
d56 1
a56 1
tfsPktType p_type[6]={
d60 1
d70 1
d91 1
a91 3
* *parameters : reqid - RequestID of snap request*
* *buff - address of data buffer*
* *length - length of data buffer*
d110 1
a110 3
* *parameters : reqid - RequestID of snap request*
* *buff - address of data buffer*
* *length - length of data buffer*
d129 1
a129 3
* *parameters : reqid - RequestID of snap request*

*   *buff - address of data buffer*
*   *length - length of data buffer*
d141 19]

1.31 [MODIFYING NEIGHBOR SERVERS HANDLING ALGORITHM IN CASE OF LACK OF AVAILABLE MEMORY, MODIFYING ALGORITHM OF MODIFICATION OF LIST OF NEIGHBORS, SEE CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]

date **2001.06.01**.10.22.34; author media; state Exp;
branches;

```
[log
@*** empty log message ***
@
text
@d6 1
a6 1
 * $Id: fserv.cc,v 1.30 2001/05/02 12:12:18 dev Exp $
d95 1
a95 1
int tfsTopd::fserv_search_reply(tfsRequestID reqid, char* buff, int length)
d101 2
a102 2
  if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid, buff, length,
TOPD_SLICE_SEARCH_REPLY);
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_SLICE_SEARCH_REPLY);
d116 1
a116 1
int tfsTopd::fserv_read_reply(tfsRequestID reqid, char* buff, int length)
d122 2
a123 2
  if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid, buff, length,
TOPD_SLICE_READ_REPLY);
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_SLICE_READ_REPLY);
d137 1
a137 1
int tfsTopd::fserv_dirrecord_reply(tfsRequestID reqid, char* buff, int length)
d143 2
```

a144 2
if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid, buff, length, TOPD_DIRREC_SEARCH_REPLY);
else rc=search_reply(reqid, get_neighbour_number(myself), buff, length, TOPD_DIRREC_SEARCH_REPLY);]

1.30 **[REVIEWING CODE IN ASSOCIATED MODULES, DEBUG FUNCTIONS USED INSTEAD OF SIMPLE LOGGING OF PROGRAMM EXECUTION FOR APPROACHING FULL FUNCTIONALITY OF DEVELOPED MODULES, A UTILITY NECESSARY FOR OVERALL FUNCTIONALITY OF THE PROJECT]**
date **2001.05.02**.12.12.18; author dev; state Exp;
branches;
[log
@Global code review.
TFS_assert -> ASSERT
removed all tfsLog functions. debug() is used instead
SWSoft -> SWsoft :)
@
text
@d6 1
a6 1
** $Id: fserv.cc,v 1.29 2001/04/25 16:18:56 media Exp $*
d79 2]

1.28 **[INTERFACE TO FILE SERVER MODIFYING, SEARCHIN AVAILABLE NEIGHBOUR SERVERS, JOINING SLICES/CHUNKS BACK INTO THE FILE AFTER READ REQUEST EXECUTION), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.04.20**.10.46.27; author media; state Exp;
branches;
[log
@join read request
@
text
@d4 1
a4 1
** $Id: fserv.cc,v 1.27 2001/04/20 10:26:04 media Exp $*

d100 1
a100 1
else rc=search_reply(reqid, get_neighbour_number(myself), buff, length, TOPD_DIRREC_SEARCH_REPLY);]

1.27 **[MODIFYING TRACING LINES, MODIFYING CODE RELATED TO DIRECTORY RECORDS AND SLICE/CHUNK ACCESS, SEARCH REQUEST FINAL IMPLEMENTATION, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.04.20**.10.26.04; author media; state Exp;
branches;
[@final search request imple,entation
@
text
@d4 1
a4 1
* *$Id: fserv.cc,v 1.26 2001/04/20 09:23:00 media Exp $*
d120 2
a121 2
if (header_get_hops_number(buff, length)) rc=initiate_slice_transfer_reply(reqid, buff, length);
else rc=slice_transfer_reply(reqid, get_neighbour_number(myself), buff, length);]

1.26 **[MODIFYING SEARCH ALGORITHM OF NEIGHBOR SERVERS FOR DATA TO BE TRANSFERRED, SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.04.20**.09.23.00; author media; state Exp;
branches;
[@join search proc
@
text
@d4 1
a4 1
* *$Id: fserv.cc,v 1.25 2001/04/19 11:10:46 media Exp $*
d100 1
a100 1
else rc=slice_search_reply(reqid, get_neighbour_number(myself), buff, length);
d142 1

a142 1
else rc=dirrecord_reply(reqid, get_neighbour_number(myself), buff, length);]

1.24 **[MODIFICATION OF DIRECTORY PROCESSING WHILE RETRIEVING AND JOINING SLICES OF FILES STORED ON THE NETWORKED SERVERS, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.04.19**.08.22.10; author media; state Exp;
branches;
[@remove neighbour address attachment
@
text
@d4 1
a4 1
* * $Id: fserv.cc,v 1.23 2001/04/13 09:23:57 media Exp $*
d66 6
a71 6
if (req_type==SNAP_REQUEST) PRINTD2("send snap request to fserv");
if (req_type==READ_REQUEST) PRINTD2("send read request to fserv");
if (req_type==DIRREC_REQUEST) PRINTD2("send directory record list request to fserv");
if (req_type==SLICE_WRITE) PRINTD2("send slice write request to fserv");
if (req_type==ZEROBLOCK_WRITE) PRINTD2("send zeroblock write request to fserv");
if (req_type==DIRREC_WRITE) PRINTD2("send directory record write request to fserv");]

1.22 **[IMPROVE STABILITY OF DATA TRANSMISSION BETWEEN SERVERS, MODIFYING DEBUGGING LINES FOR FIXING PROBLEMS WITH SERVERS' STORAGE CAPABILITIES, SEE CLAIM 45 ("distributing the plurality of pieces to the neighbor servers in the same group in order to achieve a desired fault tolerance level")]**

date **2001.04.12**.11.37.14; author media; state Exp;
branches;
[@change no memory debug level
@
text

@d4 1
a4 1
 ** $Id: fserv.cc,v 1.21 2001/04/12 11:35:27 media Exp $*
d77 1
a77 1
 }]

1.16 [DEBUGGING LINES MODIFICATION, MODIFYING PROCESSING OF RETRIEVING AND PROCESSING IDENTIFIERS OF SLICES/CHUNKS OF THE FILES THAT HAVE BEEN DISTRIBUTED TO THE SERVERS, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]
date **2001.04.04.**10.33.33; author media; state Exp;
branches;
[@code review
@
text
@d4 1
a4 1
 ** Author: Ruslan Iljin <media@@www.rt.mipt.ru>*
d6 1
a6 1
 ** $Id: fserv.cc,v 1.15 2001/03/30 12:43:36 media Exp $*
d8 1
a8 6
 **/*

```
/*
 * fserv.cc
 *
 * This file contains interface to file server
d14 8
d28 1
a28 1
   PRINTD2("fileserver_send: there is no fserv\n");
d34 1
a34 1
   PRINTD2("Packet sent to fserv\n");
```

```
d41 1
a41 1
int tfsTopd::fserv_write_request(tfsRequestID reqid, char* buff, int length, int req_type)
d44 7
a50 1
 tfsPktType p_type[3]={TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ,
TFS_MSG_T2F_SLICE_WRITE_REQ, TFS_MSG_T2F_DIRRECORD_WRITE_REQ};
d53 6
a58 3
 if (req_type==SLICE_WRITE) PRINTD2("send slice write request to fserv\n");
 if (req_type==ZEROBLOCK_WRITE) PRINTD2("send zeroblock write request to
fserv\n");
 if (req_type==DIRREC_WRITE) PRINTD2("send directory record write request to
fserv\n");
a63 22
int tfsTopd::fserv_search_request(tfsRequestID reqid, char* buff, int length)
{
 int rc;

 INFUNC(tfsTopd::fserv_search_request);
 PRINTD2("send slice search request to fserv\n");
 tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SNAP_REQ,length,buff,reqid);
 rc=fserv_send(p);
 OUTFUNCINT(rc);
}

int tfsTopd::fserv_dirrecord_request(tfsRequestID reqid, char* buff, int length)
{
 int rc;

 INFUNC(tfsTopd::fserv_dirrecord_request);
 PRINTD2("send dirrec request to fserv\n");
 tfsPKT *p = new tfsPKT(TFS_MSG_T2F_DIRRECORD_LIST_REQ,length,buff,reqid);
 rc=fserv_send(p);
 OUTFUNCINT(rc);
}

d69 1
a69 1
 PRINTD2("got slice search reply from fserv\n");
d80 1
```

```
a80 1
 PRINTD2("got dirrec reply from fserv\n");
a85 11
int tfsTopd::fserv_read_request(tfsRequestID reqid, char* buff, int length)
{
 int rc;

 INFUNC(tfsTopd::fserv_read_request);
 PRINTD2("send slice read request to fserv\n");
 tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SLICE_READ_REQ,length,buff,reqid);
 rc=fserv_send(p);
 OUTFUNCINT(rc);
}

d91 1
a91 1
 PRINTD2("got slice read reply from fserv\n");]
```

1.15 **[DEBUGGING PROCESS MODIFICATION, MODIFYING PROCEDURES OF CHANNEL OPENING AND CONNECTING VIA OPENED CHANNEL WHILE PROCESSING PACKETS OF DATA BETWEEN SERVERS (NODES) OF THE DISTRIBUTED STORAGE (MODIFICATION OF PROCEDURE OF RETRIEVING CHUNKS FROM NEIGHBOR SERVERS AND SEARCHING SERVERS CONTAINING DATA RELATED TO CHUNKS OF FILES, SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2001.03.30**.12.43.36; author media; state Exp;
branches;

```
[@removed tabs spaces
@
text
@d4 1
a4 1
 * Author:     Ruslan Iljin <media@@www.rt.mipt.ru>
d6 1
a6 1
 * $Id: fserv.cc,v 1.14 2001/03/23 15:29:23 sinvv Exp $
d10 2
a11 2
/*
```

```
 * fserv.cc
d23 1
d26 1
a26 1
   return -1;
d29 2
a30 2
 if ((C_fserv->state == tfsChannel::CONNECTED)||(C_fserv->state ==
tfsChannel::OPENED))
 {
d34 2
a35 2
 }
 return count;
d40 1
d42 2
d47 3
a49 2
 tfsPKT *p = new tfsPKT(p_type[req_type],length,buff,reqid);
 fserv_send(p);
d51 1
a51 1

d54 7
a60 3
 PRINTD2("send slice search request to fserv\n");
 tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SNAP_REQ,length,buff,reqid);
 fserv_send(p);
d65 7
a71 3
 PRINTD2("send dirrec request to fserv\n");
 tfsPKT *p = new tfsPKT(TFS_MSG_T2F_DIRRECORD_LIST_REQ,length,buff,reqid);
 fserv_send(p);
d76 7
a82 3
 PRINTD2("got slice search reply from fserv\n");
 if (header_get_hops_number(buff, length)) initiate_slice_search_reply(reqid, buff,
length);
 else slice_search_reply(reqid, myself->Address, buff, length);
d87 7
a93 3
```

PRINTD2("got dirrec reply from fserv\n");
if (header_get_hops_number(buff, length)) initiate_dirrecord_reply(reqid, buff, length);
else dirrecord_reply(reqid, myself->Address, buff, length);
d98 7
a104 3
PRINTD2("send slice read request to fserv\n");
*tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SLICE_READ_REQ,length,buff,reqid);*
fserv_send(p);
d109 7
a115 3
PRINTD2("got slice read reply from fserv\n");
if (header_get_hops_number(buff, length)) initiate_slice_transfer_reply(reqid, buff, length);
else slice_transfer_reply(reqid, myself->Address, buff, length);]

1.14 **[FILE HEADER AND COPYRIGHTS MODIFICATION (MODIFYING PROCEDURE OF NEIGHBOR SERVERS TABLE CORRECTION, ALSO MODIFYING ALGORITHM OF SEARCHING NEIGHBOR SERVER CONTAINING REQUIRED CHUNK, IMPROVE STABILITY OF NETWORK CONNECTIONS), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**

```
date	2001.03.23.15.29.23; author sinvv; state Exp;
branches;
[@Change copyright sinvv@@
@
text
@d6 1
a6 1
 * $Id: /home/cvs/aspfs/topd/fserv.cc,v 1.13 2001/02/23 11:15:18 media Exp $
d24 2
a25 2
	PRINTD2("fileserver_send: there is no fserv\n");
	return -1;
d29 5
a33 5
	 {
		PRINTD2("Packet sent to fserv\n");
		C_fserv->PutQ(p);
		count++;
```

}]

1.13 **[DEBUGGING PROCESS MODIFICATION, MODIFYING SLICES/CHUNK SEARCHING PROCEDURE FOR SEARCHING FOR FILE CHUNKS STORED ON THE SERVERS, MODIFYUNG REQUESTS PROCESSING, MODIFICATION ALGORITHM OF FILE SYSTEM DATA PROCESSING), SEE, E.G., CLAIM 57 ("dividing a plurality of servers into a plurality of groups such that each server belongs to at least one group; supporting file access services on each of the servers for accessing files of the distributed file storage system; giving file names for the files uniformly within the distributed file storage system independent of location of the files on the servers; storing the files in the distributed file storage system using the names; and accessing the files using the file access services from any of servers")]**
date 2001.02.23.11.15.18; author media; state Exp;
branches;
log
*@*** empty log message ****
@
text
@d2 1
d4 1
a4 1
** Copyright (C) SWSoft 1999-2000*
d6 1
a6 6
** Author: Ruslan Iljin*
** E-mail: media@@www.rt.mipt.ru*
***
** $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.12 2001/02/22 14:52:34 media Exp $*
***
** Last correct: 16/Nov/00*
@

1.12 **[DEBUGGING PROCESS MODIFICATION, MODIFYING SLICES AND DIRECTORY RECORDS WRITING TO NEIGHBOR SERVERS, ALSO IMPROVEMENT IN NETWORK COMMUNICATIONS, SEE CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.02.22**.14.52.34; author media; state Exp;

branches;
[log
*@*** empty log message ****
@
text
@d8 1
a8 1
* * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.11 2001/01/30 17:48:43 media Exp $*
d58 1
a58 1
int tfsTopd::fserv_params_request(tfsRequestID reqid, char buff, int length)*
d60 2
a61 2
PRINTD2("send params request to fserv\n");
*tfsPKT *p = new tfsPKT(TFS_MSG_T2F_PARAMS_REQ,length,buff,reqid);*
d72 1
a72 1
int tfsTopd::fserv_params_reply(tfsRequestID reqid, char buff, int length)*
d74 3
a76 3
PRINTD2("got params reply from fserv\n");
if (header_get_hops_number(buff, length)) initiate_params_reply(reqid, buff, length);
else params_reply(reqid, myself->Address, buff, length);]

1.11 **[ADDING TRACING LINES FOR DEBUGGING, MODIFYING REQUESTS EXECUTION, MODIFYING SLICES PROCESSING PROCEDURE FOR ACCESSING FILE PIECES ON THE SERVERS (MODIFYING PROCEDURES PROCESSING REQUESTS FOR AVAILABLE SLICES AND PROCEDURES OF PROCESSING CORRESPONDING REPLIES, IN PREVIOUS VERSIONS – MODIFICATION OF ALGORITHM OF DETECTING CANDIDATES FOR TABLE OF NEIGHBOR SERVERS), SEE CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2001.01.30**.17.48.43; author media; state Exp;
branches;
*[@*** empty log message ****
@
text
@d8 1
a8 1
* * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.10 2001/01/30 17:29:44 media Exp $*

d43 1
a43 1
tfsPktType p_type[2]={TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ,
TFS_MSG_T2F_SLICE_WRITE_REQ};
d45 2
a46 1
else PRINTD2("send zeroblock write request to fserv\n");]

1.9 **[ADDING TRACING LINES FOR DEBUGGING, MODIFYING PROCEDURES OF CHANNEL OPENING AND CONNECTING VIA OPENED CHANNEL WHILE PROCESSING PACKETS OF DATA BETWEEN SERVERS (NODES) OF THE DISTRIBUTED STORAGE (MODIFICATION OF ALGORITHM OF NEIGHBOR SERVERS TABLE CORRECTION), SEE, E.G., CLAIM 26 ("a list of neighbor servers maintained by each server, wherein the list is used to obtain information for reconstructing files stored on the distributed file system")]**
date **2000.12.05**.11.43.19; author media; state Exp;
branches;
next 1.8;

1.8 **[FILE HEADER CHANGING ASSOCIATED WITH OTHER MODULES MODIFICATION (MODIFICATION OF ALGORITHM OF CHOOSING NEIGHBOR SERVER FOR WRITING FILE CHUNKS), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2000.12.05**.09.38.18; author media; state Exp;
branches;
next 1.7;

1.6 **[MODIFICATION OF ROUTINES SUPPORTING SERVER CONNECTIONS (MODIFICATION OF PROCEDURE WRITING FILE CHUNKS TO NEIGHBOR SERVERS), SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2000.11.30**.15.11.41; author media; state Exp;
branches;

next 1.5;

1.4 **[INTERMEDIATE VERSION FOR NEIGHBOR SERVERS INTERCONNECTION, WHERE IMPLEMENTED MAIN FUNCTIONALITY OF SENDING AND RECEIVING DATA PACKETS, REQUIRED FOR DATA COLLECTION, INCLUDING FILE DATA AND DIRECTORY DATA, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2000.11.30**.13.01.11; author media; state Exp;
branches;
next 1.3;

53. Thus, the invention was conceived prior to the filing dates of Boykin et al. and Lahr et al., and the inventors were working diligently on constructive and/or actual reduction to practice between the filing date of Boykin et al. and Lahr et al., and July 30, 2001, the filing date of this application.

54. As the persons signing below, we hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issue thereupon.

Date	Alexander Tormasov
Date	Mikhail Khassine
Date	Serguei Beloussov
Date	Stanislav Protassov

next 1.5;

1.4 [INTERMEDIATE VERSION FOR NEIGHBOR SERVERS INTERCONNECTION, WHERE IMPLEMENTED MAIN FUNCTIONALITY OF SENDING AND RECEIVING DATA PACKETS, REQUIRED FOR DATA COLLECTION, INCLUDING FILE DATA AND DIRECTORY DATA, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]
date **2000.11.30**.13.01.11; author media; state Exp;
branches;
next 1.3;

53. Thus, the invention was conceived prior to the filing dates of Boykin et al. and Lahr et al., and the inventors were working diligently on constructive and/or actual reduction to practice between the filing date of Boykin et al. and Lahr et al., and July 30, 2001, the filing date of this application.

54. As the persons signing below, we hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issue thereupon.

Nov 8 2005	
Date	Alexander Tormasov
Nov 8 2005	
Date	Mikhail Khassine
November 8, 2005	
Date	Serguei Beloussov
Nov 8 2005	
Date	Stanislav Protassov

for ꜰᴏʀᴍᴀsᴏᴠ

next 1.5;

1.4 **[INTERMEDIATE VERSION FOR NEIGHBOR SERVERS INTERCONNECTION, WHERE IMPLEMENTED MAIN FUNCTIONALITY OF SENDING AND RECEIVING DATA PACKETS, REQUIRED FOR DATA COLLECTION, INCLUDING FILE DATA AND DIRECTORY DATA. SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]**
date **2000.11.30.13.01.11**; author media; state Exp;
branches;
next 1.3;

53. Thus, the invention was conceived prior to the filing dates of Boykin et al. and Lahr et al., and the inventors were working diligently on constructive and/or actual reduction to practice between the filing date of Boykin et al. and Lahr et al., and July 30, 2001, the filing date of this application.

54. As the persons signing below, we hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issue thereupon.

Date	Alexander Tormasov
Date	Mikhail Khassine
Date	Serguei Beloussov
Date	Stanislav Protassov

next 1.5;

1.4 [INTERMEDIATE VERSION FOR NEIGHBOR SERVERS INTERCONNECTION, WHERE IMPLEMENTED MAIN FUNCTIONALITY OF SENDING AND RECEIVING DATA PACKETS, REQUIRED FOR DATA COLLECTION, INCLUDING FILE DATA AND DIRECTORY DATA, SEE CLAIM 57 ("supporting file access services on each of the servers for accessing files of the distributed file storage system"), CLAIM 66 ("wherein information for reconstructing files stored on the distributed file system is obtained from the functionally equivalent servers")]
date **2000.11.30**.13.01.11; author media; state Exp;
branches;
next 1.3;

53. Thus, the invention was conceived prior to the filing dates of Boykin et al. and Lahr et al., and the inventors were working diligently on constructive and/or actual reduction to practice between the filing date of Boykin et al. and Lahr et al., and July 30, 2001, the filing date of this application.

54. As the persons signing below, we hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issue thereupon.

Date	Alexander Tormasov
Date	Mikhail Khassine
November 8, 2005 Date	Serguei Beloussov
Date	Stanislav Protassov

EXHIBIT A

Redundant Clustered Distributed Filesystem

RCDFS

Version 0.3

REDACTED

Revision History

Date	Version	Description	Author
[redacted]	0.0	Imported A.Tormasov document	Yuri Pudgorodsky
[redacted]	0.1	Design Draft	Yuri Pudgorodsky
[redacted]	0.2	Implementation Strategy Reworked	Yuri Pudgorodsky
[redacted]	0.3	Converted to HTML	Yuri Pudgorodsky

Table of Contents

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1. Purpose

The purpose of this document is to provide short technical overview of RCDFS - Redundant Clustered Distributed Filesystem, base filesystem for ASP data Server of Project Wolf.

2. Overview

Data server should handle data. Data should be stored and delivered to place of request. Typically for such purposes modern OS use concept of file system (FS). Implementation of any FS be a very complex task, and, it usually hardly depend upon a underlying OS.

But typical set of requirements to local FS running on particular computer do not include features like high availability in cluster or effective support of distributed operations.

Proposed concept of Virtual Environments (VE) for each ASP end user requires that each instance of VE should have own set of files, including system ones.

Technically all operations inside VE could be done by local FS. For example, all write operations could be done locally.

Considering Linux as a platform for ASP we could mention, that all implementation of local FS do not have the following set of ASP platform requirements:

- **distributed access**
- **hierarchical uniform naming space**
- **high performance (fast access to any file in cluster)**
- **scalability support of 100s computers in network**
- **consistency journaling support and transactional features, including fast faults recovery**
- **fault tolerance - any computer could be switched off without loosing of access to any data in file system; any network connection could disappear**
- **self configurable - easy growth - any computer could be attached into network without user intervention into software (only some hardware connection should be done)**
- **security - ACL type access or (at least) UNIX style grouping security; optional encryption**

Some of these features have direct mapping in local FS abilities, some not. For example, VE from inside do not need distributed features, fault tolerance is not a question of functionality of software to be run inside VE, high performance - not a real question of typical ASP user. Mentioned problems are problems

of ASP - as service provider, quality of his service, maintainability, etc.

Otherwise, producing a new file system with all mentioned features could be very time- and resource- consuming task.

Reasonable compromise could be a development of storage server as an add-on to local file system.

Taking into account current features of Linux FS we could define the following set of data storage server requirements:

- **easy mapping to semantics of local FS on Linux - ASPdS should operate by the same concepts than local FS (at least, have superset of it implemented)**
- **easy integration of it with local FS - localFS have to obtain a new features by calling some ASPdS services, and have to do it effectively**
- **distributed access to files (any node in cluster could access it)**
- **scalability - close-to-linear extensibility in amount of nodes; addition of new node to cluster should not influence to overall performance**
- **controlled high availability of data - level of fault tolerance features should be controllable in range from localFS supported (usually nothing) up to transaction based (journalled) with all record operation immediately available**
- **maintainability - easiness of installation and handling (minimization of TCO)**
- **locking support for distributed access to file in global namespace**

Interesting, that we don't need a special locking feature for typical operation - each VE run under control of the single OS kernel on behalf of a given hardware unit, and support any locking from underlying OS. In case of distributed applications

they should utilize a couple of VEs on different nodes and use existing network-distributed SDK (MPI or PVM environment, for example).

In such a implementation we use a local FS as a file cache for global data storage.

Some applications (paraller database engines in cluster, for example) may want a high-availability distributed data storage. ASPdS with appropriate locking support and possible tuning of block allocation policy may provide such functionality.

What possibilities could be trade for these features? Probably we could use some CPU power, some additional disk space and some network performance. The actual penalty needs to be determined (measured) lately.

3. Design Principals

Here I describe main principles of organization of ASP cluster:

- **Equality of all nodes:**
  each node in cluster have the same control functions

- **Locality of all algorithms:**
  each node have information only about some adjacent neighbors it interested in and never have any global tables

- ***Reuse of existing file systems features:***
  each file stored on a local filesystem, application accesses data via a well balanced and robust implementations of native linux filesystems

- **Regulated redundancy of data:**

each file stored in form of pieces and amount of pieces could vary; each piece exist in the only exemplar in system (no traditional caching - we just cache additional amount of pieces) Pieces are stored on distributed nodes, providing high availability. Filesystems may be restored in case of absence of some pieces.

- <u>Versioned files:</u>
  each file stored in a set of transaction data (treat it as versions of file); and each version could not be changed both in size and data (instead we just generate a new transaction with new file version). There will be a user-controlled tools to access a previous version of a given file, list version information and restore a state of a file to some specified version.
- <u>Timestamped versions:</u>
  Transaction is marked with the current time and transaction ID - in order to provide and access to "snapshots" of filesystem for given time while maintaining unique id.
- <u>Uniformly distributed network loading:</u>
  we could move data in parallel manner from network to particular node (depending upon a topology) and thus utilize a network channel with minimal current network loading
- <u>Migration of information to the place of it's active utilization:</u>
  we could move pieces of file to nodes on which they are intensively used
- Time should be synced on each nodes of cluster.

4. Network Topology

Suggested physical network topology is a single segment within

a switched environment. For performance reasons node may want to know about its place in switched topology and the throughput of its network interface. However there are no direct restriction of a physical topology, it may be also a LAN with an arbitrary topology or even an global distributed environment. The only required ability is a presence of uniform broadcast or multicast group within a cluster.

Logically a node autoconfigure its place with the nearest neighbors to find active participants for redundant data storage. The filesystem daemons maintain permanently opened connection to node neighbors.

In case of a neighbor failure a parent node initiate a failover switch to another neighbor. After the restored availability of a previous neighbor it initiates a request to its parent node. The parent node may response with a switchover connection to a restored node or continue to work with the current neighbor, depending on the actual amount of its data available on one or another node.

During normal oparation nodes do not change its neighbors. The amount of neighbors used depends on required data redundancy (configuration parameter). The algorithm for automatic neighbors selection based on CPU/disk/network load needs been addressed lately.

5. Files representation

Each file consists of two parts:

- **locally stored data to provide fast access to the latest file version;**
- **remotely stored data to provide high availability and versioning.**

In case of unavailability of local representation (disk failure, node failure - VE restarted on different node, insufficient disk space, etc...) it will be retrieved from the remote representation.

Local representation is just a native file representation on a local filesystem. Only some parts of the file may been stored locally (for performance/bandwidth/disk space reasons). Local representation reuses the property of the local filesystem (i.e. journalling, very large file support, etc.). The proposed local filesystem for the ASP cluster should definitely include journalling support. Currently, there are four candidates on the role:

reiserfs	**http://devlinux.com/projects/reiserfs/**
ext	**http://web.mit.edu/tytso/www/linux/**
JFS	**http://oss.software.ibm.com/developerworks/opensoı**
XFS	**http://oss.sgi.com/projects/xfs/**

Right now it is difficult to find out the best journalling FS for our needs, all the above filesystems are currently at the development and/or alpha testing stage. For today the reiserfs has been more thoroughly tested while IBM JVS has the most potentials due to it large history on AIX. Probably within the time constraints of the 2.4 linux kernel release (summer 2000) there will be more arguments for the choice.

Remote representation consists of set of extents: fixed size blocks. Block size could be variable. Files are assembled/reassembled in user space daemons. Not necessary to assemble whole file to provide access to them - it could be only small part of them.

Each block could have any number of versions. Versions are

numbered and sequenced by combination of timestamp and transaction ID number unique for each node (to avoid small resolution time and time sync problems). Main idea of such a numbering is a detection of last version of each file block to assemble.

Generally, remote file representation consists of set of blocks grouped in transactions.

6. Regulated redundancy and versioning

Each block stored in form: divided into N pieces, and any K pieces of them (K <= N) are enough to assemble initial block. Size of each block are minimized and equal to (size of block)/K with minimal overhead of some additional info in header. Appropriate mathematics are exists.

Typically file divided into at least N = (K+M) pieces, where M - amount of the nodes which could disappear simultaneously. Each block is stored on a separate remote node. There are K+M individual nodes with block pieces and the removal of M of them still gives an ability to restore block.

Maximal amount of possible pieces are restricted in the very initial stage of piece creation - and should be reasonable large (up to K*L where L - max nodes in cluster).

Each block piece exists in the only instance - we do not use any copies; instead, we provide an additional piece.

7. File access

File open:

- **Check for actuality of a local file copy. If the local copy is up-to-date, use it. Such check will use a network request only**

once-per-session of FS support daemons, so for typical system usage it will be a once per file from VE boot time.

- **If local copy not found:**
    - **translate logical name of file into physical ID of blocks (via directory data)**
    - **send a multicast request for blocks to network**
    - **after receiving number of replies that at least we could assemble one file extent release make a local copy of assembled data, and return open call with success.**
    - **send a block transfer packets (read-ahead)**
- **Think of:**
    - **Cache of a negative (file not found) replies.**

Read access (the same for one or more blocks not necessary to assemble all file locally!):

- **check for availability of current block to read in local filesystem**
- **if available read it and return**
- **if not available send search request, wait for response, and then send a pieces transfer request. Immediately after receiving of appropriate amount of pieces cancel all other transfers and assemble block in local cache; read it and return**

After receiving a search request each node have to return block with the latest (timestamp + transaction_counter).

Write requests depend upon a consistency requirements. Generally, we store file locally and queue disassemble request for remote storing. After the queuing transaction, we return success to a userspace from the write request.

As copy-on-write files, deleted files need to be marked in local VE cache too.

For files opened in synchronous write mode (O_SYNC) we could wait for remote storing procedure to complete physical write on remote neighbors. However this kind of redundancy seems a little paranoid for me so an intermediate solution is suggested: the write call will wait for physical operation on local file write request and queue transaction to be completed. In such way we ensure the locally store data has been gone to disk, and remote storing requests has been journalled locally to physical media.

In general, we can provide all levels of synchronous write support:

- on synchronous operation;
- synchronous update of local FS transaction log (journalling local FS);
- synchronous update of local FS (UNIX O_SYNC);
- synchronous update of RCDFS remote store request;
- syncrounous RCDFS remote store (wait for data to be sent to neigbors);
- syncrounous RCDFS remote store, waiting for neigbors write to complete on physical media;

The typical applications for each FS mode needs to be specified.

8. Garbage collection

Another significant question of such a versioning system is a garbage collection - removal of old block versions. Generally, we post all blocks to system only after commit operation for particular transaction. This means that if we want to remove any particular version of block we have to be sure that we could assemble next version of this block. The problem is that we have to be sure that ALL blocks participating in transaction available for assembling. Probably, purge request will be send by node posting transaction after successful placing of all pieces.

9. Pieces distribution

Pieces distribution algorithm have to place it on appropriate amount of nodes (in agreement with fault tolerance requirements), and provide some migration mechanism to minimize a network loading (just move each piece to node on which it will be used maximally intensively).

10. VE support

Each VE within a local node should receive its own separate filesystem namespace begin s from root. For the purpose of disk space optimization, we will provide a "copy-on-write" mechanism within a local node.

From global node namespace (not within VE) the given filesystem subtree is assigned for VE support. Within it, each VE receives its own subtree for the VE root namespace. Also, some another subtree has been assigned a status of "VE template".

For file read access, the VE personal subtree (/.ve/VE-ID/...) has been checked first. If file exists, it is accessed from here. If file here does not exists, VE template subtree has been checked. On success the special kind of link has been created within VE personal subtree. This link copies all file attributes while for the file content application is been redirected to VE template disk space.

For file read-write (modify) access, we extend this algorithm with copy on write policy: if application gets a template file and modifies its contents, the file content is actually copied into personal VE subtree replacing the special kind link.

File creation always occurred within personal VE subtree.

```
/--                                          (global namespace root)
|-- tmp
|-- usr
|       |-- bin
|       |-- lib
.......
|--.ve-template
             /--                             (template filesystem layo
             |-- bin

|--.ve                                       (mount point of VE suppor
       |-- 1
       |    /-- (root of VE with ID=1)
            |     |-- bin
            |
            |-- 21
            |     /--      (root of VEwith ID=21)
            |     |-- bin
```

11. Performance estimation

To be calculated.

12. Portability

In general, most VE implementations are kernel-dependent and could not be easily ported to another UNIX. But used open and highly modular approach could significantly simplify such a task.

The implementation of the cluster part of this project are highly portable and allow utilization not only different dialects of Unix on different hardware platforms, but also such platforms like Windows 2000.

13. Implementation Strategy

Like any network or distributed filesystems, RCDFS consists of a kernel-level FS modules and a set of user mode processes (daemons). The daemons run outside VE in the usermode

namespace of each node. On a later project stage, these daemons may been rewritten as a kernel-mode threads for performance reason.

Currently, the need for some daemons come mind:

- ds-lookupd
  - node autoconfiguration
  - name lookup in the global cluster namespace
- ds-cored
  - handle RCDFS request for remote read and write requests
  - transaction id generation
  - handle read/write/delete block requests
- ds-supportd
  - collect usage statistic
  - garbage collection

For broadcast traffic, IP multicasting may be used for easy access to an IP network with complex topology.

14. Things to be addressed

- Name lookup algorithm: method for caching negative (file not found replies) locally.
- Disk / network bandwidth / cpu usage optimization criteria for choosing neighbors.
- Interaction^ with a linux buffer-cache: is it a task for our module or we just make a local file copy available and then redirect request to a local filesystem driver.
- Files stored locally only partial: method of redirecting local read request to remote transaction.
- Access to previous file versions: define semantics and user tools.
- Disk quotas.
- Implementation details of garbage collection.

- **Global namespace support (cluster-visible).**
- **Distributed locking support.**

Document Owner: Yuri Pudgorodsky, ASPLinux yur@sw.mipt.ru
Base Document: Project Wolf, Techical Vision from Alex Tormasov, dated [redacted]

Redacted

EXHIBIT B

```
head	1.13;
access;
symbols
	aspfs_0_9_1_dev:1.13
	aspfs_0_9_dev:1.12;
locks; strict;
comment	@ * @;


1.13
date	2002.10.21.20.07.14;	author dev;	state Exp;
branches;
next	1.12;

1.12
date	2001.06.06.09.29.18;	author media;	state Exp;
branches;
next	1.11;

1.11
date	2001.05.14.13.48.45;	author media;	state Exp;
branches;
next	1.10;

1.10
date	2001.05.02.12.12.18;	author dev;	state Exp;
branches;
next	1.9;

1.9
date	2001.04.13.09.23.57;	author media;	state Exp;
branches;
next	1.8;

1.8
date	2001.04.12.09.51.01;	author media;	state Exp;
branches;
next	1.7;

1.7
date	2001.04.10.14.55.41;	author media;	state Exp;
branches;
next	1.6;

1.6
date	2001.03.31.14.24.19;	author media;	state Exp;
branches;
next	1.5;

1.5
date	2001.03.30.10.31.07;	author media;	state Exp;
branches;
next	1.4;

1.4
date	2001.03.22.09.14.13;	author media;	state Exp;
branches;
next	1.3;

1.3
date	2001.03.12.11.18.26;	author media;	state Exp;
branches;
next	1.2;
```

```
1.2
date	2001.02.26.12.15.11;	author media;	state Exp;
branches;
next	1.1;

1.1
date	2001.02.15.14.04.50;	author media;	state Exp;
branches;
next	;


desc
@@


1.13
log
@Added WorkDir
@
text
@/*
 * Copyright (C) SWsoft 2000-2001
 *
 * Author:  Ruslan Iljin <media@@www.rt.mipt.ru>
 *
 * $Id: config.h,v 1.12 2001/06/06 09:29:18 media Exp $
 *
 * Description: headers for config file processing
 *
 */

#ifndef __TOPD_CONFIG_H__
#define __TOPD_CONFIG_H__

#ifdef __cplusplus
extern "C" {
#endif

#ifdef DEFINE_CONFIG_VARIABLES
  #define DECLARE
  #define DEFAULT(x) =x;
#else
  #define DEFAULT(x)
  #ifdef __cplusplus
    #define DECLARE extern "C"
  #else
    #define DECLARE extern
  #endif
#endif

int parse_config(const char* conf_name, int looketc);

DECLARE void add_neighbour_from_config(char *neigh);

DECLARE char* BindToAddress DEFAULT("0.0.0.0");
DECLARE char* WorkDir DEFAULT("~/storage");

DECLARE char* CoordAddress DEFAULT(NULL);

DECLARE int   Daemon                  DEFAULT(1);

/* timeouts */
DECLARE int   TOPD_TIMEOUT_RECONNECT      DEFAULT(30);
```

```
DECLARE int   TOPD_TIMEOUT_STAGE_0        DEFAULT(5);

DECLARE int   TOPD_TIMEOUT_WRITE_STAGE_1 DEFAULT(20);
DECLARE int   TOPD_TIMEOUT_WRITE_STAGE_2 DEFAULT(20);

DECLARE int   TOPD_TIMEOUT_READ_STAGE_1  DEFAULT(60);
DECLARE int   TOPD_TIMEOUT_READ_STAGE_2  DEFAULT(60);

DECLARE int   TOPD_TIMEOUT_SNAP_STAGE_1  DEFAULT(15);
DECLARE int   TOPD_TIMEOUT_SNAP_STAGE_2  DEFAULT(20);

DECLARE int   TOPD_TIMEOUT_DIRREC_STAGE_1 DEFAULT(15);

DECLARE int   TOPD_TIMEOUT_BLOCK0_STAGE_1 DEFAULT(15);

DECLARE int   TOPD_TIMEOUT_PROXY          DEFAULT(10);

#ifdef __cplusplus
}            // extern "C"
#endif

#undef _TOPD_READ_ALL_SLICES_    /* read all available slices? if undef read
only required number of slices */
#undef _TOPD_REMOVE_AFTER_READ_  /* remove snap entry after reading? */
#undef _TOPD_LOOP_PING_          /* continue pinging neighbours for dynamic
table? */

#endif
@


1.12
log
@*** empty log message ***
@
text
@d6 1
a6 1
 * $Id: config.h,v 1.11 2001/05/14 13:48:45 media Exp $
d36 1
@


1.11
log
@fixed many bugs in lists
@
text
@d6 1
a6 1
 * $Id: config.h,v 1.10 2001/05/02 12:12:18 dev Exp $
d56 2
@


1.10
log
@Global code review.
TFS_assert -> ASSERT
removed all tfsLog functions. debug() is used instead
SWSoft -> SWsoft :)
@
text
@d6 1
```

```
a6 1
 * $Id: config.h,v 1.9 2001/04/13 09:23:57 media Exp $
d33 2
d37 1
a37 1
DECLARE char* CoordAddress DEFAULT("0.0.0.0");
@


1.9
log
@remove trailing spaces
@
text
@d2 1
a2 1
 * Copyright (C) SWSoft 2000-2001
d4 3
a6 1
 * $Id: config.h,v 1.8 2001/04/12 09:51:01 media Exp $
a8 2
 *
 * Author:  Ruslan Iljin <media@@www.rt.mipt.ru>
@


1.8
log
@header files description
@
text
@d4 1
a4 1
 * $Id: config.h,v 1.41 2001/04/12 08:26:34 media Exp $
d11 1
a11 1

@


1.7
log
@code review
@
text
@d1 11
d39 1
a39 1
/* timeouts */
d44 2
a45 2
DECLARE int   TOPD_TIMEOUT_WRITE_STAGE_1 DEFAULT(20);
DECLARE int   TOPD_TIMEOUT_WRITE_STAGE_2 DEFAULT(20);
d47 2
a48 2
DECLARE int   TOPD_TIMEOUT_READ_STAGE_1  DEFAULT(60);
DECLARE int   TOPD_TIMEOUT_READ_STAGE_2  DEFAULT(60);
d50 2
a51 2
DECLARE int   TOPD_TIMEOUT_SNAP_STAGE_1  DEFAULT(15);
DECLARE int   TOPD_TIMEOUT_SNAP_STAGE_2  DEFAULT(20);
d53 1
a53 1
DECLARE int   TOPD_TIMEOUT_DIRREC_STAGE_1 DEFAULT(15);
```

```
@


1.6
log
@changes in dyn tables
@
text
@d28 17
a44 1
DECLARE int   TOPD_TIMEOUT_RECONNECT DEFAULT(30);
@


1.5
log
@changes for new analize functions
@
text
@d34 3
a36 3
#define _TOPD_READ_ALL_SLICES_     0    /* read all available slices? if 0 read
only required number of slices */
#define _TOPD_REMOVE_AFTER_READ_   0    /* remove snap entry after reading? */
#define _TOPD_LOOP_PING_           0    /* continue pinging neighbours for
dynamic table? */
@


1.4
log
@*** empty log message ***
@
text
@d1 2
a2 2
#ifndef __CONFIG_H__
#define __CONFIG_H__
d33 4
@


1.3
log
@*** empty log message ***
@
text
@d28 2
@


1.2
log
@*** empty log message ***
@
text
@d24 2
@


1.1
log
@*** empty log message ***
@
```

```
text
@a22 12
DECLARE char* TopdAddress   DEFAULT("127.0.0.1");

DECLARE char* WorkDir DEFAULT("~/clroot/");
DECLARE char* TmpDir DEFAULT("/tmp/");

DECLARE int   PutFileMaxBloxPerStep DEFAULT(100);
DECLARE int   GetFileMaxBloxPerStep DEFAULT(100);

DECLARE int   TimeOutPut0Block      DEFAULT(5);
DECLARE int   TimeOutGetSnap        DEFAULT(5);

DECLARE int   TimeOutTopdReconnect  DEFAULT(5);
@
```

EXHIBIT C

```
head	1.34;
access;
symbols
	aspfs_0_9_1_dev:1.34
	aspfs_0_9_dev:1.34;
locks; strict;
comment	@// @;


1.34
date	2001.06.19.13.15.53;	author media;	state Exp;
branches;
next	1.33;

1.33
date	2001.06.06.09.29.18;	author media;	state Exp;
branches;
next	1.32;

1.32
date	2001.06.01.12.22.23;	author media;	state Exp;
branches;
next	1.31;

1.31
date	2001.06.01.10.22.34;	author media;	state Exp;
branches;
next	1.30;

1.30
date	2001.05.02.12.12.18;	author dev;	state Exp;
branches;
next	1.29;

1.29
date	2001.04.25.16.18.56;	author media;	state Exp;
branches;
next	1.28;

1.28
date	2001.04.20.10.46.27;	author media;	state Exp;
branches;
next	1.27;

1.27
date	2001.04.20.10.26.04;	author media;	state Exp;
branches;
next	1.26;

1.26
date	2001.04.20.09.23.00;	author media;	state Exp;
branches;
next	1.25;

1.25
date	2001.04.19.11.10.46;	author media;	state Exp;
branches;
next	1.24;

1.24
date	2001.04.19.08.22.10;	author media;	state Exp;
branches;
next	1.23;
```

```
1.23
date	2001.04.13.09.23.57;	author media;	state Exp;
branches;
next	1.22;

1.22
date	2001.04.12.11.37.14;	author media;	state Exp;
branches;
next	1.21;

1.21
date	2001.04.12.11.35.27;	author media;	state Exp;
branches;
next	1.20;

1.20
date	2001.04.12.11.33.26;	author media;	state Exp;
branches;
next	1.19;

1.19
date	2001.04.12.10.42.10;	author media;	state Exp;
branches;
next	1.18;

1.18
date	2001.04.12.10.34.20;	author media;	state Exp;
branches;
next	1.17;

1.17
date	2001.04.12.10.26.35;	author media;	state Exp;
branches;
next	1.16;

1.16
date	2001.04.04.10.33.33;	author media;	state Exp;
branches;
next	1.15;

1.15
date	2001.03.30.12.43.36;	author media;	state Exp;
branches;
next	1.14;

1.14
date	2001.03.23.15.29.23;	author sinvv;	state Exp;
branches;
next	1.13;

1.13
date	2001.02.23.11.15.18;	author media;	state Exp;
branches;
next	1.12;

1.12
date	2001.02.22.14.52.34;	author media;	state Exp;
branches;
next	1.11;

1.11
date	2001.01.30.17.48.43;	author media;	state Exp;
branches;
next	1.10;
```

```
1.10
date    2001.01.30.17.29.44;    author media;    state Exp;
branches;
next    1.9;

1.9
date    [redacted].11.43.19;    author media;    state Exp;
branches;
next    1.8;

1.8
date    [redacted].09.38.18;    author media;    state Exp;
branches;
next    1.7;

1.7
date    [redacted].14.40.12;    author media;    state Exp;
branches;
next    1.6;

1.6
date    [redacted].15.11.41;    author media;    state Exp;
branches;
next    1.5;

1.5
date    [redacted].14.20.48;    author media;    state Exp;
branches;
next    1.4;

1.4
date    [redacted].13.01.11;    author media;    state Exp;
branches;
next    1.3;

1.3
date    [redacted].13.18.39;    author media;    state Exp;
branches;
next    1.2;

1.2
date    [redacted].08.57.38;    author media;    state Exp;
branches;
next    1.1;

1.1
date    [redacted].13.21.27;    author media;    state Exp;
branches;
next    ;


desc
@@


1.34
log
@*** empty log message ***
@
text
@/*
 * Copyright (C) SWsoft 2000-2001
 *
```

REDACTED

```
 * Author:  Ruslan Iljin <media@@www.rt.mipt.ru>
 *
 * $Id: fserv.cc,v 1.33 2001/06/06 09:29:18 media Exp $
 *
 * Description: this file contains interface to file server
 *
 */

#include "topd.h"

/*
 * function       :   tfsTopd::fserv_send
 * prototype in   :   topd.h
 * description    :   send packet to client channel
 * parameters     :   p   - packet to send
 * return         :   int - send count
 * errors         :   TFS_E_TOPD_FSERV_WRONG
 */
int tfsTopd::fserv_send(tfsPKT *p)
{
  int count=0;

  INFUNC(tfsTopd::fserv_send);
  if (!C_fserv) {
    PRINTD2("fileserver_send: there is no fserv");
    OUTFUNCINT(TFS_E_TOPD_FSERV_WRONG);
  }

  if  ((C_fserv->state == tfsChannel::CONNECTED)||(C_fserv->state ==
tfsChannel::OPENED))
  {
    PRINTD2("Packet sent to fserv");
    C_fserv->PutQ(p);
    count++;
  }
  OUTFUNCINT(count);
}

/*
 * function       :   fserv_common_request
 * prototype in   :   topd.h
 * description    :   send snap, read, dirrec, write request to fserv
 * parameters     :   reqid - RequestID of snap request
 *                    buff  - address of data buffer
 *                    length   - length of data buffer
 *                    req_type - request type
 * return         :   int - result of fserv_send
 * errors         :   TFS_E_TOPD_NO_MEMORY
 */
int tfsTopd::fserv_common_request(tfsRequestID reqid, char* buff, int length,
int req_type)
{
  int rc;

  tfsPktType p_type[7]={
  TFS_MSG_T2F_SNAP_REQ,
  TFS_MSG_T2F_SLICE_READ_REQ,
  TFS_MSG_T2F_DIRRECORD_LIST_REQ,
  TFS_MSG_T2F_BLOCK0_LIST_REQ,
  TFS_MSG_T2F_SLICE_WRITE_REQ,
  TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ,
  TFS_MSG_T2F_DIRRECORD_WRITE_REQ};

  INFUNC(tfsTopd::fserv_common_request);
```

```
  if (req_type==TOPD_SNAP_REQUEST) PRINTD2("send snap request to fserv");
  if (req_type==TOPD_READ_REQUEST) PRINTD2("send read request to fserv");
  if (req_type==TOPD_DIRREC_REQUEST) PRINTD2("send directory record list request
to fserv");
  if (req_type==TOPD_BLOCK0_REQUEST) PRINTD2("send block0 list request to
fserv");
  if (req_type==TOPD_SLICE_WRITE) PRINTD2("send slice write request to fserv");
  if (req_type==TOPD_ZEROBLOCK_WRITE) PRINTD2("send zeroblock write request to
fserv");
  if (req_type==TOPD_DIRREC_WRITE) PRINTD2("send directory record write request
to fserv");

  tfsPKT *p = new tfsPKT(p_type[req_type],length,buff,reqid);
  if (!p) {
    PRINTD("ERROR: not enough memory");
    OUTFUNCINT(TFS_E_TOPD_NO_MEMORY);
  }
  rc=fserv_send(p);

  if (TFS_E_CHECK(rc)) rc=0;

  OUTFUNCINT(rc);
}

/*
 * function      :   fserv_search_reply
 * prototype in  :   topd.h
 * description   :   processing snap reply from fserv
 * parameters    :   p - packet with reply
 * return        :   int - result of initiate function
 * errors        :   apropriate to initiate function
 */
int tfsTopd::fserv_search_reply(tfsPKT *p)
{
  int rc;

  INFUNC(tfsTopd::fserv_search_reply);
  PRINTD2("got slice search reply from fserv");
  if (header_get_hops_number(p->data, p->length)) rc=initiate_search_reply(p,
TOPD_SLICE_SEARCH_REPLY);
  else rc=search_reply(p, get_neighbour_number(myself),
TOPD_SLICE_SEARCH_REPLY);
  OUTFUNCINT(rc);
}

/*
 * function      :   fserv_read_reply
 * prototype in  :   topd.h
 * description   :   processing read reply from fserv
 * parameters    :   p - packet with reply
 * return        :   int - result of initiate function
 * errors        :   apropriate to initiate function
 */
int tfsTopd::fserv_read_reply(tfsPKT *p)
{
  int rc;

  INFUNC(tfsTopd::fserv_read_reply);
  PRINTD2("got slice read reply from fserv");
  if (header_get_hops_number(p->data, p->length)) rc=initiate_search_reply(p,
TOPD_SLICE_READ_REPLY);
  else rc=search_reply(p, get_neighbour_number(myself), TOPD_SLICE_READ_REPLY);
  OUTFUNCINT(rc);
```

```
}

/*
 * function      :   fserv_dirrecord_reply
 * prototype in :   topd.h
 * description  :   processing dirrecord reply from fserv
 * parameters   :   p - packet with reply
 * return       :   int - result of initiate function
 * errors       :   apropriate to initiate function
 */
int tfsTopd::fserv_dirrecord_reply(tfsPKT *p)
{
  int rc;

  INFUNC(tfsTopd::fserv_dirrecord_reply);
  PRINTD2("got dirrec reply from fserv");
  if (header_get_hops_number(p->data, p->length)) rc=initiate_search_reply(p,
TOPD_DIRREC_SEARCH_REPLY);
  else rc=search_reply(p, get_neighbour_number(myself),
TOPD_DIRREC_SEARCH_REPLY);
  OUTFUNCINT(rc);
}

/*
 * function      :   fserv_block0_reply
 * prototype in :   topd.h
 * description  :   processing block0 reply from fserv
 * parameters   :   p - packet with reply
 * return       :   int - result of initiate function
 * errors       :   apropriate to initiate function
 */
int tfsTopd::fserv_block0_reply(tfsPKT *p)
{
  int rc;

  INFUNC(tfsTopd::fserv_block0_reply);
  PRINTD2("got block0 reply from fserv");
  if (header_get_hops_number(p->data, p->length)) rc=initiate_search_reply(p,
TOPD_BLOCK0_SEARCH_REPLY);
  else rc=search_reply(p, get_neighbour_number(myself),
TOPD_BLOCK0_SEARCH_REPLY);
  OUTFUNCINT(rc);
}
@


1.33
log
@*** empty log message ***
@
text
@d6 1
a6 1
 * $Id: fserv.cc,v 1.32 2001/06/01 12:22:23 media Exp $
a161 1

@


1.32
log
@*** empty log message ***
@
text
```

```
@d6 1
a6 1
 * $Id: fserv.cc,v 1.31 2001/06/01 10:22:34 media Exp $
d56 1
a56 1
  tfsPktType p_type[6]={
d60 1
d70 1
d91 1
a91 3
 * parameters    :   reqid - RequestID of snap request
 *                   buff  - address of data buffer
 *                   length   - length of data buffer
d110 1
a110 3
 * parameters    :   reqid - RequestID of snap request
 *                   buff  - address of data buffer
 *                   length   - length of data buffer
d129 1
a129 3
 * parameters    :   reqid - RequestID of snap request
 *                   buff  - address of data buffer
 *                   length   - length of data buffer
d141 19
@


1.31
log
@*** empty log message ***
@
text
@d6 1
a6 1
 * $Id: fserv.cc,v 1.30 2001/05/02 12:12:18 dev Exp $
d95 1
a95 1
int tfsTopd::fserv_search_reply(tfsRequestID reqid, char* buff, int length)
d101 2
a102 2
  if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid,
buff, length, TOPD_SLICE_SEARCH_REPLY);
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_SLICE_SEARCH_REPLY);
d116 1
a116 1
int tfsTopd::fserv_read_reply(tfsRequestID reqid, char* buff, int length)
d122 2
a123 2
  if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid,
buff, length, TOPD_SLICE_READ_REPLY);
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_SLICE_READ_REPLY);
d137 1
a137 1
int tfsTopd::fserv_dirrecord_reply(tfsRequestID reqid, char* buff, int length)
d143 2
a144 2
  if (header_get_hops_number(buff, length)) rc=initiate_search_reply(reqid,
buff, length, TOPD_DIRREC_SEARCH_REPLY);
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_DIRREC_SEARCH_REPLY);
@
```

```
1.30
log
@Global code review.
TFS_assert -> ASSERT
removed all tfsLog functions. debug() is used instead
SWSoft -> SWsoft :)
@
text
@d6 1
a6 1
 * $Id: fserv.cc,v 1.29 2001/04/25 16:18:56 media Exp $
d79 2
@


1.29
log
@*** empty log message ***
@
text
@d2 1
a2 1
 * Copyright (C) SWSoft 2000-2001
d4 3
a6 1
 * $Id: fserv.cc,v 1.28 2001/04/20 10:46:27 media Exp $
a8 2
 *
 * Author:  Ruslan Iljin <media@@www.rt.mipt.ru>
@


1.28
log
@join read request
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.27 2001/04/20 10:26:04 media Exp $
d100 1
a100 1
  else rc=search_reply(reqid, get_neighbour_number(myself), buff, length,
TOPD_DIRREC_SEARCH_REPLY);
@


1.27
log
@final search request imple,entation
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.26 2001/04/20 09:23:00 media Exp $
d120 2
a121 2
  if (header_get_hops_number(buff, length))
rc=initiate_slice_transfer_reply(reqid, buff, length);
  else rc=slice_transfer_reply(reqid, get_neighbour_number(myself), buff,
length);
@
```

```
1.26
log
@join search proc
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.25 2001/04/19 11:10:46 media Exp $
d100 1
a100 1
  else rc=slice_search_reply(reqid, get_neighbour_number(myself), buff, length);
d142 1
a142 1
  else rc=dirrecord_reply(reqid, get_neighbour_number(myself), buff, length);
@


1.25
log
@add TOPD prefix to const
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.24 2001/04/19 08:22:10 media Exp $
d99 1
a99 1
  if (header_get_hops_number(buff, length))
rc=initiate_slice_search_reply(reqid, buff, length);
d141 1
a141 1
  if (header_get_hops_number(buff, length)) rc=initiate_dirrecord_reply(reqid,
buff, length);
@


1.24
log
@remove neighbour address attachment
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.23 2001/04/13 09:23:57 media Exp $
d66 6
a71 6
  if (req_type==SNAP_REQUEST) PRINTD2("send snap request to fserv");
  if (req_type==READ_REQUEST) PRINTD2("send read request to fserv");
  if (req_type==DIRREC_REQUEST) PRINTD2("send directory record list request to
fserv");
  if (req_type==SLICE_WRITE) PRINTD2("send slice write request to fserv");
  if (req_type==ZEROBLOCK_WRITE) PRINTD2("send zeroblock write request to
fserv");
  if (req_type==DIRREC_WRITE) PRINTD2("send directory record write request to
fserv");
@


1.23
log
@remove trailing spaces
@
text
```

```
@d4 1
a4 1
 * $Id: fserv.cc,v 1.22 2001/04/12 11:37:14 media Exp $
d100 1
a100 1
  else rc=slice_search_reply(reqid, myself->Address, buff, length);
d121 1
a121 1
  else rc=slice_transfer_reply(reqid, myself->Address, buff, length);
d142 1
a142 1
  else rc=dirrecord_reply(reqid, myself->Address, buff, length);
@


1.22
log
@change no memory debug level
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.21 2001/04/12 11:35:27 media Exp $
d77 1
a77 1
  }
@


1.21
log
@no memory check
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.20 2001/04/12 11:33:26 media Exp $
d75 1
a75 1
    PRINTD1("ERROR: not enough memory");
@


1.20
log
@*** empty log message ***
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.19 2001/04/12 10:42:10 media Exp $
d74 4
@


1.19
log
@fserv desription
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.18 2001/04/12 10:34:20 media Exp $
d64 1
```

```
a64 1
  INFUNC(tfsTopd::fserv_write_request);
@


1.18
log
@*** empty log message ***
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.17 2001/04/12 10:26:35 media Exp $
d41 11
d55 1
d65 1
d72 1
d75 1
d79 10
d100 31
a141 10
int tfsTopd::fserv_read_reply(tfsRequestID reqid, char* buff, int length)
{
  int rc;

  INFUNC(tfsTopd::fserv_read_reply);
  PRINTD2("got slice read reply from fserv");
  if (header_get_hops_number(buff, length))
rc=initiate_slice_transfer_reply(reqid, buff, length);
  else rc=slice_transfer_reply(reqid, myself->Address, buff, length);
  OUTFUNCINT(rc);
}
@


1.17
log
@header files description
@
text
@d4 1
a4 1
 * $Id: fserv.cc,v 1.16 2001/04/04 10:33:33 media Exp $
d55 1
a55 1
  if (req_type==DIRREC_REQUST) PRINTD2("send directory record list request to
fserv");
@


1.16
log
@code review
@
text
@d4 1
a4 1
 * Author:    Ruslan Iljin <media@@www.rt.mipt.ru>
d6 1
a6 1
 * $Id: fserv.cc,v 1.15 2001/03/30 12:43:36 media Exp $
d8 1
a8 6
 */
```

```
/*
 * fserv.cc
 *
 * This file contains interface to file server
d14 8
d28 1
a28 1
    PRINTD2("fileserver_send: there is no fserv\n");
d34 1
a34 1
    PRINTD2("Packet sent to fserv\n");
d41 1
a41 1
int tfsTopd::fserv_write_request(tfsRequestID reqid, char* buff, int length, int
req_type)
d44 7
a50 1
  tfsPktType p_type[3]={TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ,
TFS_MSG_T2F_SLICE_WRITE_REQ, TFS_MSG_T2F_DIRRECORD_WRITE_REQ};
d53 6
a58 3
  if (req_type==SLICE_WRITE) PRINTD2("send slice write request to fserv\n");
  if (req_type==ZEROBLOCK_WRITE) PRINTD2("send zeroblock write request to
fserv\n");
  if (req_type==DIRREC_WRITE) PRINTD2("send directory record write request to
fserv\n");
a63 22
int tfsTopd::fserv_search_request(tfsRequestID reqid, char* buff, int length)
{
  int rc;

  INFUNC(tfsTopd::fserv_search_request);
  PRINTD2("send slice search request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SNAP_REQ,length,buff,reqid);
  rc=fserv_send(p);
  OUTFUNCINT(rc);
}

int tfsTopd::fserv_dirrecord_request(tfsRequestID reqid, char* buff, int length)
{
  int rc;

  INFUNC(tfsTopd::fserv_dirrecord_request);
  PRINTD2("send dirrec request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_DIRRECORD_LIST_REQ,length,buff,reqid);
  rc=fserv_send(p);
  OUTFUNCINT(rc);
}

d69 1
a69 1
  PRINTD2("got slice search reply from fserv\n");
d80 1
a80 1
  PRINTD2("got dirrec reply from fserv\n");
a85 11
int tfsTopd::fserv_read_request(tfsRequestID reqid, char* buff, int length)
{
  int rc;

  INFUNC(tfsTopd::fserv_read_request);
  PRINTD2("send slice read request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SLICE_READ_REQ,length,buff,reqid);
```

```
  rc=fserv_send(p);
  OUTFUNCINT(rc);
}

d91 1
a91 1
  PRINTD2("got slice read reply from fserv\n");
@


1.15
log
@removed tabs spaces
@
text
@d4 1
a4 1
 * Author:  Ruslan Iljin <media@@www.rt.mipt.ru>
d6 1
a6 1
 * $Id: fserv.cc,v 1.14 2001/03/23 15:29:23 sinvv Exp $
d10 2
a11 2
/*
 * fserv.cc
d23 1
d26 1
a26 1
    return -1;
d29 2
a30 2
  if  ((C_fserv->state == tfsChannel::CONNECTED)||(C_fserv->state ==
tfsChannel::OPENED))
  {
d34 2
a35 2
  }
  return count;
d40 1
d42 2
d47 3
a49 2
  tfsPKT *p = new tfsPKT(p_type[req_type],length,buff,reqid);
  fserv_send(p);
d51 1
a51 1

d54 7
a60 3
  PRINTD2("send slice search request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SNAP_REQ,length,buff,reqid);
  fserv_send(p);
d65 7
a71 3
  PRINTD2("send dirrec request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_DIRRECORD_LIST_REQ,length,buff,reqid);
  fserv_send(p);
d76 7
a82 3
  PRINTD2("got slice search reply from fserv\n");
  if (header_get_hops_number(buff, length)) initiate_slice_search_reply(reqid,
buff, length);
  else slice_search_reply(reqid, myself->Address, buff, length);
d87 7
```

```
a93 3
  PRINTD2("got dirrec reply from fserv\n");
  if (header_get_hops_number(buff, length)) initiate_dirrecord_reply(reqid,
buff, length);
  else dirrecord_reply(reqid, myself->Address, buff, length);
d98 7
a104 3
  PRINTD2("send slice read request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_SLICE_READ_REQ,length,buff,reqid);
  fserv_send(p);
d109 7
a115 3
  PRINTD2("got slice read reply from fserv\n");
  if (header_get_hops_number(buff, length)) initiate_slice_transfer_reply(reqid,
buff, length);
  else slice_transfer_reply(reqid, myself->Address, buff, length);
@


1.14
log
@Change copyright sinvv@@
@
text
@d6 1
a6 1
 * $Id: /home/cvs/aspfs/topd/fserv.cc,v 1.13 2001/02/23 11:15:18 media Exp $
d24 2
a25 2
      PRINTD2("fileserver_send: there is no fserv\n");
      return -1;
d29 5
a33 5
        {
            PRINTD2("Packet sent to fserv\n");
            C_fserv->PutQ(p);
            count++;
        }
@


1.13
log
@*** empty log message ***
@
text
@d2 1
d4 1
a4 1
 * Copyright (C) SWSoft 1999-2000
d6 1
a6 6
 * Author:              Ruslan Iljin
 * E-mail:              media@@www.rt.mipt.ru
 *
 * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.12 2001/02/22 14:52:34 media Exp $
 *
 * Last correct: [redacted]
@
```
REDACTED

```
1.12
log
@*** empty log message ***
```

```
@
text
@d8 1
a8 1
 * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.11 2001/01/30 17:48:43 media Exp $
d58 1
a58 1
int tfsTopd::fserv_params_request(tfsRequestID reqid, char* buff, int length)
d60 2
a61 2
  PRINTD2("send params request to fserv\n");
  tfsPKT *p = new tfsPKT(TFS_MSG_T2F_PARAMS_REQ,length,buff,reqid);
d72 1
a72 1
int tfsTopd::fserv_params_reply(tfsRequestID reqid, char* buff, int length)
d74 3
a76 3
  PRINTD2("got params reply from fserv\n");
  if (header_get_hops_number(buff, length)) initiate_params_reply(reqid, buff,
length);
  else params_reply(reqid, myself->Address, buff, length);
@


1.11
log
@*** empty log message ***
@
text
@d8 1
a8 1
 * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.10 2001/01/30 17:29:44 media Exp $
d43 1
a43 1
  tfsPktType p_type[2]={TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ,
TFS_MSG_T2F_SLICE_WRITE_REQ};
d45 2
a46 1
   else PRINTD2("send zeroblock write request to fserv\n");
@


1.10
log
@*** empty log message ***
@
text
@d8 1
a8 1
 * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.9 2000/12/05 11:43:19 media Exp $
d54 7
@


1.9
log
@*** empty log message ***
@
text
@d8 1
a8 1
 * $Header: /home/cvs/aspfs/topd/fserv.cc,v 1.8 [redacted] 09:38:18 media Exp $
d62 7
@
```

REDACTED

```
1.8
log
@*** empty log message ***
@
text
@d8 1
a8 1
 * $Header: /usr/virtual/cvsroot/torfs/topd/fserv.cc,v 1.3 2000/11/29 12:21:34
media Exp $
d35 1
a35 1
            C_fserv->PutQ(p->copy());
@


1.7
log
@*** empty log message ***
@
text
@@


1.6
log
@*** empty log message ***
@
text
@@


1.5
log
@*** empty log message ***
@
text
@@


1.4
log
@*** empty log message ***
@
text
@@


1.3
log
@*** empty log message ***
@
text
@@


1.2
log
@*** empty log message ***
@
text
@d8 1
a8 1
```

```
 * $Header: /usr/virtual/cvsroot/torfs/topd/fserv.cc,v 1.2 [redacted] 10:33:39
media Exp $
d44 2
a45 2
  PRINTD2("send slice write request to fserv\n");
//  if (type==TFS_MSG_C2T_BLOCK_WRITE_REQ) type=TFS_MSG_T2F_BLOCK_WRITE_REQ;
a61 7
}

int tfsTopd::fserv_write_reply(tfsRequestID reqid, char* buff, int length)
{
  PRINTD2("got write reply from fserv\n");
  if (header_get_hops_number(buff, length)) initiate_write_reply(reqid, buff,
length);
  else write_reply(reqid, myself->Address, buff, length);
@


1.1
log
@*** empty log message ***
@
text
@@
```

REDACTED

EXHIBIT D

Топологический сервер (TopD)

Версия 1.2 от [redacted]

Топологический сервер - поддерживает связность сети, отвечает за определение и слежение за изменением топологии сети и выделение у каждого компьютера набора соседей. Все взаимодействия между компонентами TorFS осуществляются посредством топологических серверов. Компьютер на котором запущен топологический сервер является нодой TorFS.

Таким образом основная задача топологического сервера - выполнение запросов TorFS и изменение и поддержание связи с соседями.

Топологический сервер (далее TopD) выполняет следующие запросы: открытие файла (поиск покрытия, SNAP), чтение слайса (READ), запись слайса (WRITE)

При запуске TopD получает список соседей (neighbour list), некоторые из этих соседей будут статическими, то есть TopD будет стараться поддерживать постоянную связь с ними, остальные динамическими, то есть они будут заменяться с помошью алгоритма динамического конфигурирования. Суть этого алгоритма в том, чтобы динамическими соседями TopD являлись наиболее близкие (по некоторым критериям) ноды TorFS. Каждый сосед в списке имеет свой номер, который используется при маршрутизации пакетов. Соседом номер 0 является сам TopD.

В случае если вдруг связь со статическим соседом прерывается, то проводится периодическая проверка доступности этой ноды и как только она станет доступной TopD присоединится к ней как к статическому соседу. Возможно также записывать статистику доступности такого соседа, и предупреждение администратора о "ненадежности" статического соседа.

Алгоритм изменения динамических соседей в списке следующий. Для начала мы имеем список хотябы их одного динамического соседа. Далее мы получаем от него IP адреса его соседей и посылаем пакет ping по этим IP, далее выбираем из них соседей с наименьшим временем отклика и добавляем его в список. Бывший в списке сервер удаляем. Далее операция повторяется до тех пор пока не удастся найти среди полученного списка IP ноды с меньшим временем отклика менее чем текущий динамический сосед. Разумеется при получении списка IP из него исключаются статические соседи. Так же при количестве динамических соседей больше одного, они также исключаются из получаемых списков IP.

Для хранения исполняемых запросов TopD использует таблицу запросов (request table). В ней содержатся ID запроса (reqid, уникальный ,

генерирующийся на клиенте), fid, bid, tid (или rid), тип запроса (op), стадия запроса (stage), таймаут для этой стадии запроса, и некоторая специфическая для данного запроса информация.

открытие файла (SNAP)

При получении запроса на поиск покрытия TopD помещает этот запрос в request table, инициализирует для этого запроса список серверов (server list) и список покрытий

(snap list). Server list необходим для того, чтобы хранить пути к серверам на которых были обнаружены слайсы, а snap list используется для хранения и анализа покрытия.

TFS_MSG_C2T_SNAP_REQ *"fr"* - выполнить запрос на поиск покрытия

Первая стадия (stage=1) исполнения запроса на поиск покрытия, заключается в рассылке всем соседям этого запроса, запрос же посланный самому себе отправляется файловому серверу, если такой запущен на данной ноде TorFS. Далее каждый соседний TopD, получивший этот запрос посылает его на свой файловый сервер всем своих соседям, кроме того, от которого он пришел. Далее все повторяется. Таким образом запрос на поиск распространяется от одной ноды TorFS по всей сети. Для предотвращения затопления сети такими пакетами ограничено количество шагов (MAX HOP) и время жизни первой стадии запроса. Для предотвращения закольцовывания (loop) пакетов при прохождении пакета через ноду TorFS TopD добавляет этот запрос (с данным reqid) в request table и помечает это запрос как транзитный (op=TOPD_PROXY) и запрещает повторное прохождение транзитных запросов с данным reqid через эту ноду TorFS в течении жизни этого запроса.

Все пакеты, которыми обмениваются между собой TopD, кроме тела запроса содержат еще заголовок (header) необходимый для маршрутизации пакетов в TorFS, они содержат время жизни пакета, путь пройденный пакетом и его длину. Этот header передается и файловому серверу, и возвращается при ответе от файлового сервера неизменным.

Важно, что тот reqid, который поступает на ноду, инициирующую поиск покрытия, передается со всеми пакетами и остается неизменным до окончания выполнения запроса и даже передается в запрос на чтение использующий данное покрытие.

TFS_MSG_T2T_SNAP_REQ *"Hfr"* - с помошью этих пакетов происходит распространение запроса от TopD к соседним TopD

TFS_MSG_T2F_SNAP_REQ *"Hfr"* - передача запроса на поиск покрытия файловому серверу

При получении ответа от файлового сервера TopD анализирует header и начинает процесс возвращения ответа на запрос к инициатору по цепочке TopD.

TFS_MSG_F2T_SNAP_REPLY *"Hftxm4(t4(bs))"* - ответ от файлового сервера, t - максимальный tid в покрытии, xm - нулевой блок, далее список слайсов в покрытии.

TFS_MSG_T2T_SNAP_REPLY *"Hftxm4(t4(bs))"* - возвращение запроса к инициатору запроса.

TopD инициировавший запрос получает ответы от файловых серверов сети, заносит их в server list и snap list. По истечении таймаута на stage=1, TopD выдает ответ клиентскому серверу, приславшему этот запрос.

TFS_MSG_T2C_SNAP_REPLY *"ftxm4(tb)"* - возвращает покрытие клиенту

После этого этот запрос переходит в stage=2 и хранится некоторое время в request table на случай если будет выполняться запрос на чтение для данного reqid.

чтение слайса (READ)

При получении запроса на чтение TopD находит SNAP для этого запроса у себя в request table, находит номера слайсов и пути к файловым серверам

TFS_MSG_C2T_BLOCK_READ_REQ *"fbt"* - запрос на чтение блока

Далее TopD посылает необходимое число запросов на чтение слайсов найденным в server list файловым серверам

TFS_MSG_T2T_SLICE_READ_REQ *"Hfbts"* - передача запроса на чтение слайса к нужному файловому серверу через цепочку TopD

после того как запрос доходит до последнего в цепочке TopD, тот пересылает запрос файловому серверу.

TFS_MSG_T2F_SLICE_READ_REQ *"Hfbts"* - передача запроса на чтение слайса файловому серверу

TFS_MSG_F2T_SLICE_READ_REPLY *"Hfbtsxm"* - ответ от файлового сервера, xm - размер слайса и сам слайс

Ответ так же по цепочке возвращается инициатору запроса на чтение.

TFS_MSG_T2T_SLICE_READ_REPLY *"Hfbtsxm"* - передача ответа по цепочке TopD

TFS_MSG_T2C_BLOCK_READ_REPLY *"fbtsxm"* - передача ответа клиенту

запись слайса (WRITE)

в данный момент находится в процессе обсуждения...

TFS_MSG_C2T_BLOCK_WRITE_REQ *"fbtsxm"* -

TFS_MSG_T2T_SLICE_WRITE_REQ *"Hfbtsxm"* -

TFS_MSG_T2F_SLICE_WRITE_REQ *"Hfbtsxm"* -

TFS_MSG_C2T_ZEROBLOCK_WRITE_REQ *"txm"* -

TFS_MSG_T2T_ZEROBLOCK_WRITE_REQ *"Htxm"* -

TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ *"Htxm"* -

TFS_MSG_F2T_ZEROBLOCK_WRITE_REPLY *"Ht2"* -

TFS_MSG_T2T_ZEROBLOCK_WRITE_REPLY *"Ht2"* -

TFS_MSG_T2C_ZEROBLOCK_WRITE_REPLY *"t2"* -

Маршрутизация пакетов

Для маршрутизации пакетов в TorFS используется заголовок (header) пакета, которым обмениваются между собой TopD. Заголовок имеет переменную длину зависящую от длины пути. Путь - это последовательный список номеров соседей по цепочке которых шел пакет. Каждый байт обозначает номер одного из соседей, таким образом кол-во соседей ограничено цифрой 255 (каждая нода является для себя соседом номер 0).

Формат заголовка:

TTD (4bytes)	- (1 bytes)	flag (1bytes)	count (1 bytes)	hops (1 bytes)	... path (hops byt

TTD (time to death) - это время в которое пакет должен прекратить свое существование.
- резервный байт
flag - направление прохода пакета, прямое или обратное
count - позиция в пути в данный момент
hops - общая длина в пути
path - путь

Таким образом при распространении запроса на поиск покрытия (SNAP) мы можем запоминать путь пройденный пакетом. Для этого на инициирующей машине, порождается новый заголовок (flag=1, count=0, hops=0, path=NULL). Далее соседский TopD, получивший пакет от инициатора, увеличивает hops и count, добавляет в path номер соседа от которого пришел пакет. Пакеты передаваемые соседям уже содержат новый заголовок. Соседи принимают пакет с новым заголовком и повторяют эту процедуру.

рис.1 Распространение запроса на поиск покрытия

На рис.1 проиллюстрировано распространение пакетов. TopD на каждой из машин при получении пакета изменяет поля count и hops и добавляет в path номер соседа от которого был получен пакет.

Файловому серверу также передается этот заголовок, содержание которого файловый сервер возвращает неизменным. Теперь, пользуясь содержимым этого заголовка, мы можем вернуть пакет назад. Пусть TopD на ноде "E" получил ответ от своего файлового сервера. Он проставляет flag=2 и анализирует заголовок пакета count=3, path=1,3,7. Пакет должен быть передан соседу с номером 7, то есть ноде D. TopD на ноде D при получении пакета уменьшает значение count, при этом число hops остается неизменным. Теперь count=2, path=1,3,7. Отправляем пакет соседу под номером 3 (нода B). Таким образом когда пакет придет на ноду A, после

уменьшения на 1 count станет равным 0. TopD делает вывод о том, что пакет вернулся инициатору поиска, он ищет по reqid данных запрос в request table и начинает анализ ответа.

Существует одно "но", если не менять содержимое пути при обратном проходе пакета, то после будет невозможно определить путь к файловому серверу на ноде Е. Ведь этот путь верен только от ноды Е до ноды А. Для пути от ноды А до ноды Е, путь должен выглядеть так - 2,5,4. Для этого при прохождении пакета от ноды Е к ноде А каждый TopD через который проходит пакет, перед уменьшением count меняет значение в пути на номер соседа от которого пришел возвращающийся пакет. Таким образом путь при в пакете выходям из ноды D к ноде Е будет таким - 1,3,4. Окончательный путь на ноде А будет - 2,5,4.

рис.2 возвращение пакета инициатору

В следующий раз (при реализации чтения) пакет пойдет по пути 2,5,4 по ходу меняя значения в пути так что на ноде Е опять будет путь 1,3,7 и пакет с прочитанным слайсов по этому пути вернется на ноду А.

В случае отключения или прерывания связи с соседом, сосед удаляется из листа не сразу, а помечается как неактивный, и все пакеты которые предназначаются для него, отбрасываются, и только через некоторое время когда все запросы которые могли бы проходить через это соединение закончатся. Потом в список на место этого соседа мы можем помещать новые соединения.

Таким образом реализована маршрутизация пакетов.

Примечание:

В описаниях форматов запросов и ответов используются следующие символы:

- *'H'* – заголовок (header) протокола обмена между TopD
- *'f'* – FID
- *'r'* – RID
- *'b'* – BID
- *'s'* – SID

- *'t'* – TID
- *'xm'* – размер куска данных + сам кусок данных
- '4','2','1' – соответственно 4,2 и 1 байтные поля запросов, обычно используются для передачи кол-ва элементов в передаваемом списке.

1. Описание типов данных используемых в TorFS:

Type	Length (bit)	Description
FID	128	Уникальный идентификатор файла в файловой
BID	32	Идентификатор (номер) блока в файле
SID	16	Идентификатор слайса в блоке
TID	64	Идентификатор транзакции (первые 4 байт – время созд
RID	64	Временной интервал

@ 1.7 log @Remove grammatic mistakes @ text @d1 357 a357 357

EXHIBIT E

Топологический сервер (TopD)

[TOPOLOGICAL SERVER TOPD]

Версия 1.2 от [DATE REDACTED]

[VERSION 1.2 OF [DATE REDACTED]]

Топологический сервер - поддерживает связность сети, отвечает за определение и слежение за изменением топологии сети и выделение у каждого компьютера набора соседей. Все взаимодействия между компонентами TorFS осуществляются посредством топологических серверов. Компьютер на котором запущен топологический сервер является нодой TorFS.

[THE TOPOLOGICAL SERVER MAINTAINS THE CONNECTIVITY OF THE NETWORK, AND IS RESPONSIBLE FOR DEFINING THE NETWORK AND KEEPING TRACK OF THE CHANGE OF THE TOPOLOGY OF THE NETWORK, AS WELL DEFINING, FOR EACH COMPUTER, A SET OF ITS NEIGHBORS. ALL INTERACTIONS BETWEEN COMPONENTS OF TORFS ARE CONDUCTED BY MEANS OF TOPOLOGICAL SERVERS. THE COMPUTER ON WHICH THE TOPOLOGICAL SERVER IS LAUNCHED IS A NODE OF TORFS]

Таким образом основная задача топологического сервера - выполнение запросов TorFS и изменение и поддержание связи с соседями.

[THERE, THE PRIMARY TASK OF THE TOPOLOGICAL SERVER IS RESPONDING TO REQUESTS OF TORFS AND CHANGING AND MAINTAINING THE CONNECTIONS TO THE NEIGHBORS]

Топологический сервер (далее TopD) выполняет следующие запросы: открытие файла (поиск покрытия, SNAP), чтение слайса (READ), запись слайса (WRITE)

[THE TOPOLOGICAL SERVER (HEREAFTER, TOPD) RESPONDS TO THE FOLLOWING REQUESTS: OPENING OF THE FILE SEEKING OF COVERAGE, SNAP), READING OF A SLICE (READ), WRITING OF A SLICE (WRITE)]

При запуске TopD получает список соседей (neighbour list), некоторые из этих соседей будут статическими, то есть TopD будет стараться поддерживать постоянную связь с ними, остальные динамическими, то есть они будут заменяться с помошью алгоритма динамического конфигурирования. Суть этого алгоритма в том, чтобы динамическими соседями TopD являлись наиболее близкие (по некоторым критериям) ноды

TorFS. Каждый сосед в списке имеет свой номер, который используется при маршрутизации пакетов. Соседом номер 0 является сам TopD.

[UPON LAUNCH, THE TOPD RECEIVES A LIST OF NEIGHBORS, SOME OF WHICH MIGHT BE STATIC, IN OTHER WORDS, TOPD WILL ATTEMPT TO MAINTAIN PERMANENT COMMUNICATION WITH THEM, AND OTHERS WILL BE DYNAMIC, IN OTHER WORDS, THEY WILL BE SUBSTITUTED USING A MECHANISM OF DYNAMIC CONFIGURATION. THE GIST OF THE ALGORITHM IS IN ENSURING THAT THE DYNAMIC NEIGHBORS OF TOPD ARE THOSE NODES OF TORFS THAT ARE THE CLOSEST (BY SOME CRITERIA). EACH NEIGHBOR IN THE LIST HAS ITS OWN NUMBER, USED FOR PACKET ROUTING. THE NEIGHBOR NUMBER 0 IS THE TOPD ITSELF.]

В случае если вдруг связь со статическим соседом прерывается, то проводится периодическая проверка доступности этой ноды и как только она станет доступной TopD присоединится к ней как к статическому соседу. Возможно также записывать статистику доступности такого соседа, и предупреждение администратора о "ненадежности" статического соседа.

[IN THE EVENT THAT CONNECTION TO A STATIC NEIGHBOR IS INTERRUPTED, A PERIODIC CHECK IS MADE REGARDING THE AVAILABILITY OF THIS NODE, AND AS SOON AS IT BECOMES AVAILABLE AGAIN, TOPD WILL CONNECT TO IT AS TO A STATIC NEIGHBOR. IT IS ALSO POSSIBLE TO LOG STATISTICS OF THE AVAILABILITY OF SUCH A NEIGHBOR, AND TO WARN THE ADMINISTRATOR OF THE UNRELIABILITY OF SUCH A NEIGHBOR]

Алгоритм изменения динамических соседей в списке следующий. Для начала мы имеем список хотябы их одного динамического соседа. Далее мы получаем от него IP адреса его соседей и посылаем пакет ping по этим IP, далее выбираем из них соседей с наименьшим временем отклика и добавляем его в список. Бывший в списке сервер удаляем. Далее операция повторяется до тех пор пока не удастся найти среди полученного списка IP ноды с меньшим временем отклика менее чем текущий динамический сосед. Разумеется при получении списка IP из него исключаются статические соседи. Так же при количестве динамических соседей больше одного, они также исключаются из получаемых списков IP.

[THE ALGORITHM FOR CHANGING THE DYNAMIC NEIGHBORS IN THE LIST IS AS FOLLOWS. AT FIRST, WE HAVE AN INITIAL LIST OF AT LEAST ONE DYNAMIC NEIGHBOR. NEXT, WE RECEIVE FROM THE LIST THE IP ADDRESSES OF ITS NEIGHBORS, AND SEND A PING PACKET TO THESE IP ADDRESSES, THEN SELECT IN THAT LIST A SET OF NEIGHBORS WITH THE SMALLEST RESPONSE TIME AND ADD IT TO THE LIST. A SERVER FORMERLY BEING PRESENT IN THE LIST IS

REMOVED. THEN, THE OPERATION CONTINUES, UNTIL IT IS POSSIBLE TO FIND AMONG THE FORMED LIST AN IP NODE WITH A SMALLER RESPONSE TIME THAN THE CURRENT DYNAMIC NEIGHBOR. OBVIOUSLY, UPON FORMING THE IP LIST, STATIC NEIGHBORS ARE REMOVED FROM IT. ALSO, IF THE NUMBER OF DYNAMIC NEIGHBORS IS GREATER THAN ONE, THEY ARE ALSO REMOVED FROM THE IP LIST BEING FORMED]

Для хранения исполняемых запросов TopD использует таблицу запросов (request table). В ней содержатся ID запроса (reqid, уникальный , генерирующийся на клиенте), fid, bid, tid (или rid), тип запроса (op), стадия запроса (stage), таймаут для этой стадии запроса, и некоторая специфическая для данного запроса информация.

открытие файла (SNAP) [FILE OPENING]

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TFS_MSG_C2T_SNAP_REQ *"fr"* - выполнить запрос на поиск покрытия

Первая стадия (stage=1) исполнения запроса на поиск покрытия, заключается в рассылке всем соседям этого запроса, запрос же посланный самому себе отправляется файловому серверу, если такой запущен на данной ноде TorFS. Далее каждый соседний TopD, получивший этот запрос посылает его на свой файловый сервер всем своих соседям, кроме того, от которого он пришел. Далее все повторяется. Таким образом запрос на поиск распространяется от одной ноды TorFS по всей сети. Для предотвращения затопления сети такими пакетами ограничено количество шагов (MAX HOP) и время жизни первой стадии запроса. Для предотвращения закольцовывания (loop) пакетов при прохождении пакета через ноду TorFS TopD добавляет этот запрос (с данным reqid) в request table и помечает это запрос как транзитный (op=TOPD_PROXY) и запрещает повторное прохождение транзитных запросов с данным reqid через эту ноду TorFS в течении жизни этого запроса.

Все пакеты, которыми обмениваются между собой TopD, кроме тела запроса содержат еще заголовок (header) необходимый для маршрутизации пакетов в TorFS, они содержат время жизни пакета, путь пройденный пакетом и его

длину. Этот header передается и файловому серверу, и возвращается при ответе от файлового сервера неизменным.

Важно, что тот reqid, который поступает на ноду, инициирующую поиск покрытия, передается со всеми пакетами и остается неизменным до окончания выполнения запроса и даже передается в запрос на чтение использующий данное покрытие.

TFS_MSG_T2T_SNAP_REQ *"Hfr"* - с помошью этих пакетов происходит распространение запроса от TopD к соседним TopD

TFS_MSG_T2F_SNAP_REQ *"Hfr"* - передача запроса на поиск покрытия файловому серверу

При получении ответа от файлового сервера TopD анализирует header и начинает процесс возвращения ответа на запрос к инициатору по цепочке TopD.

TFS_MSG_F2T_SNAP_REPLY *"Hftxm4(t4(bs))"* - ответ от файлового сервера, t - максимальный tid в покрытии, xm - нулевой блок, далее список слайсов в покрытии.

TFS_MSG_T2T_SNAP_REPLY *"Hftxm4(t4(bs))"* - возвращение запроса к инициатору запроса.

TopD инициировавший запрос получает ответы от файловых серверов сети, заносит их в server list и snap list. По истечении таймаута на stage=1, TopD выдает ответ клиентскому серверу, приславшему этот запрос.

TFS_MSG_T2C_SNAP_REPLY *"ftxm4(tb)"* - возвращает покрытие клиенту

После этого этот запрос переходит в stage=2 и хранится некоторое время в request table на случай если будет выполняться запрос на чтение для данного reqid.

чтение слайса (READ) [SLICE READ]

При получении запроса на чтение TopD находит SNAP для этого запроса у себя в request table, находит номера слайсов и пути к файловым серверам

TFS_MSG_C2T_BLOCK_READ_REQ *"fbt"* - запрос на чтение блока

Далее TopD посылает необходимое число запросов на чтение слайсов найденным в server list файловым серверам

TFS_MSG_T2T_SLICE_READ_REQ *"Hfbts"* - передача запроса на чтение слайса к нужному файловому серверу через цепочку TopD

после того как запрос доходит до последнего в цепочке TopD, тот пересылает запрос файловому серверу.

TFS_MSG_T2F_SLICE_READ_REQ *"Hfbts"* - передача запроса на чтение слайса файловому серверу

TFS_MSG_F2T_SLICE_READ_REPLY *"Hfbtsxm"* - ответ от файлового сервера, xm - размер слайса и сам слайс

Ответ так же по цепочке возвращается инициатору запроса на чтение.

TFS_MSG_T2T_SLICE_READ_REPLY *"Hfbtsxm"* - передача ответа по цепочке TopD

TFS_MSG_T2C_BLOCK_READ_REPLY *"fbtsxm"* - передача ответа клиенту

запись слайса (WRITE) [SLICE WRITE]

в данный момент находится в процессе обсуждения...

TFS_MSG_C2T_BLOCK_WRITE_REQ *"fbtsxm"* -

TFS_MSG_T2T_SLICE_WRITE_REQ *"Hfbtsxm"* -

TFS_MSG_T2F_SLICE_WRITE_REQ *"Hfbtsxm"* -

TFS_MSG_C2T_ZEROBLOCK_WRITE_REQ *"txm"* -

TFS_MSG_T2T_ZEROBLOCK_WRITE_REQ *"Htxm"* -

TFS_MSG_T2F_ZEROBLOCK_WRITE_REQ *"Htxm"* -

TFS_MSG_F2T_ZEROBLOCK_WRITE_REPLY *"Ht2"* -

TFS_MSG_T2T_ZEROBLOCK_WRITE_REPLY *"Ht2"* -

TFS_MSG_T2C_ZEROBLOCK_WRITE_REPLY *"t2"* -

Маршрутизация пакетов [PACKET ROUTING]

Для маршрутизации пакетов в TorFS используется заголовок (header) пакета, которым обмениваются между собой TopD. Заголовок имеет переменную длину зависящую от длины пути. Путь - это последовательный список номеров соседей по цепочке которых шел пакет. Каждый байт обозначает номер одного из соседей, таким образом кол-во соседей ограничено цифрой 255 (каждая нода является для себя соседом номер 0).

Формат заголовка: [HEADER FORMAT]

TTD (4bytes)	- (1 bytes)	flag (1bytes)	count (1 bytes)	hops (1 bytes)	... path (hops by

TTD (time to death) - это время в которое пакет должен прекратить свое существование.
- резервный байт
flag - направление прохода пакета, прямое или обратное
count - позиция в пути в данный момент
hops - общая длина в пути
path - путь

Таким образом при распространении запроса на поиск покрытия (SNAP) мы можем запоминать путь пройденный пакетом. Для этого на инициирующей машине, порождается новый заголовок (flag=1, count=0, hops=0, path=NULL). Далее соседский TopD, получивший пакет от инициатора, увеличивает hops и count, добавляет в path номер соседа от которого пришел пакет. Пакеты передаваемые соседям уже содержат новый заголовок. Соседи принимают пакет с новым заголовком и повторяют эту процедуру.

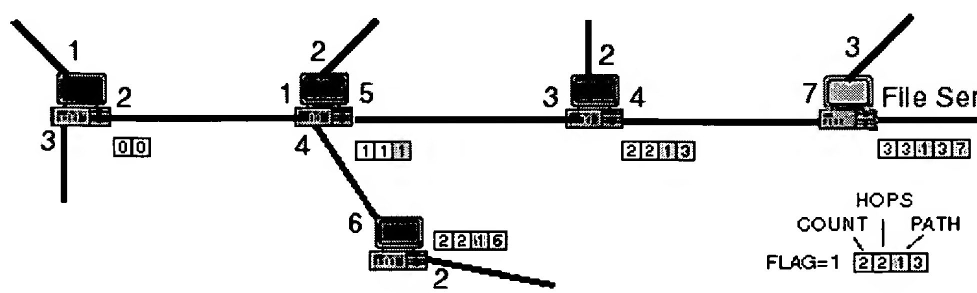


рис.1 Распространение запроса на поиск покрытия

[fig. 1 distribution of request for coverage]

На рис.1 проиллюстрировано распространение пакетов. TopD на каждой из машин при получении пакета изменяет поля count и hops и добавляет в path номер соседа от которого был получен пакет.

Файловому серверу также передается этот заголовок, содержание которого файловый сервер возвращает неизменным. Теперь, пользуясь содержимым этого заголовка, мы можем вернуть пакет назад. Пусть TopD на ноде "E" получил ответ от своего файлового сервера. Он проставляет flag=2 и анализирует заголовок пакета count=3, path=1,3,7. Пакет должен быть передан соседу с номером 7, то есть ноде D. TopD на ноде D при получении пакета уменьшает значение count, при этом число hops остается неизменным. Теперь count=2, path=1,3,7. Отправляем пакет соседу под номером 3 (нода B). Таким образом когда пакет придет на ноду A, после уменьшения на 1 count станет равным 0. TopD делает вывод о том, что пакет вернулся инициатору поиска, он ищет по reqid данных запрос в request table и начинает анализ ответа.

Существует одно "но", если не менять содержимое пути при обратном проходе пакета, то после будет невозможно определить путь к файловому серверу на ноде E. Ведь этот путь верен только от ноды E до ноды A. Для пути от ноды A до ноды E, путь должен выглядеть так - 2,5,4. Для этого при прохождении пакета от ноды E к ноде A каждый TopD через который проходит пакет, перед уменьшением count меняет значение в пути на номер соседа от которого пришел возвращающийся пакет. Таким образом путь при в пакете выходям из ноды D к ноде E будет таким - 1,3,4. Окончательный путь на ноде A будет - 2,5,4.

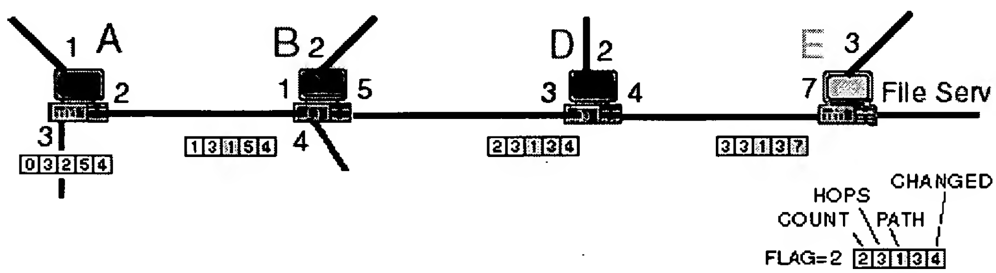


рис.2 возвращение пакета инициатору

[fig. 2 return of packet to initiator]

В следующий раз (при реализации чтения) пакет пойдет по пути 2,5,4 по ходу меняя значения в пути так что на ноде E опять будет путь 1,3,7 и пакет с прочитанным слайсов по этому пути вернется на ноду A.

В случае отключения или прерывания связи с соседом, сосед удаляется из листа не сразу, а помечается как неактивный, и все пакеты которые предназначаются для него, отбрасываются, и только через некоторое время когда все запросы которые могли бы проходить через это соединение

закончатся. Потом в список на место этого соседа мы можем помещать новые соединения.

Таким образом реализована маршрутизация пакетов.

Примечание:

В описаниях форматов запросов и ответов используются следующие символы: [THE FOLLOWING SYMBOLS ARE USED IN THE FORMATS OF REQUESTS AND RESPONSES]

- *‘H’* – заголовок (header) протокола обмена между TopD [HEADER OF PROTOCOL OF EXCHANGES BETWEEN TOPD]
- *‘f’* – FID
- *‘r’* – RID
- *’b’* – BID
- *‘s’* – SID
- *‘t’* – TID
- *‘xm’* – размер куска данных + сам кусок данных [SIZE OF SLICE + THE SLICE ITSELF
- ‘4’,’2’,’1’ – соответственно 4,2 и 1 байтные поля запросов, обычно используются для передачи кол-ва элементов в передаваемом списке. [CORRESPONDING, 4, 2, AND 1 BYTE FIELDS, USUALLY USED TO TRANSMIT THE NUMBER OF ELEMENTS IN THE LIST BEING TRANSMITTED]

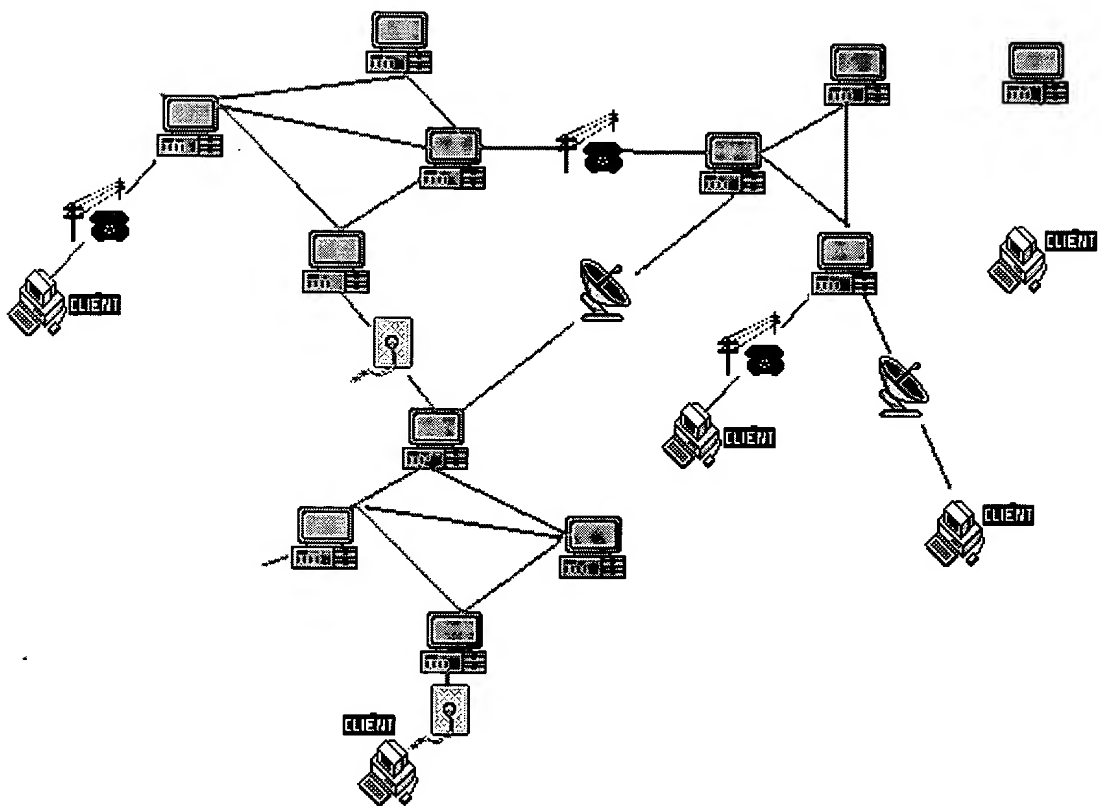
1. Описание типов данных используемых в TorFS: [DESCRIPTION OF TYPES OF DATA USED IN TORFS]

Type	Length (bit)	Description
FID	128	Уникальный идентификатор файла в файловой системе [UNIQUE FILE IDENTIFIER IN THE FILE SYSTEM]
BID	32	Идентификатор (номер) блока в файле [IDENTIFIER (NUMBER) OF BLOCK IN THE FILE]

SID	16	Идентификатор слайса в блоке [IDENTIFIER OF SLICE IN THE BLOCK]
TID	64	Идентификатор транзакции (первые 4 байт – время создания транзакции) [IDENTIFIER OF TRANSACTION (FIRST 4 BYTES ARE TIME OF CREATION OF THE TRANSACTION]
RID	64	Временной интервал [TIME INTERVAL]

@ 1.7 log @Remove grammatic mistakes @ text @d1 357 a357 357

EXHIBIT F



computer - server of system.
Top, Directory & File servers
are started on it.

computer - client of system.
Client Server is started on it

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